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ABSTRACT

During the first three phases of the Human Services Mobility Study covering the period October 1967 through March 1972, the project concentrated on: (1) the analysis of needs and potentials for upward mobility in the health industry in New York City, (2) the development of a systems-based methodology to create job and curriculum ladders in the health industry, (3) a pilot test of the methodology, and (4) the provision of technical support. The job analysis methodology devised for the project proceeds in stages, beginning with task identification and collection of skill and knowledge data and progressing to clustering tasks into related skill and knowledge hierarchies. Following field testing, the job analysis method was pilot tested in a New York City hospital. This report reviews the project activities accomplished during the first three phases, summarizes the methodology and results of the pilot study, and acts as a guide for the working papers, progress reports, and research reports resulting from the project. Project plans for the future include: (1) collecting task data in a major voluntary hospital and developing job ladders, (2) providing guidance in the use of task data, and (3) developing guidelines for curriculum ladders. (SB)

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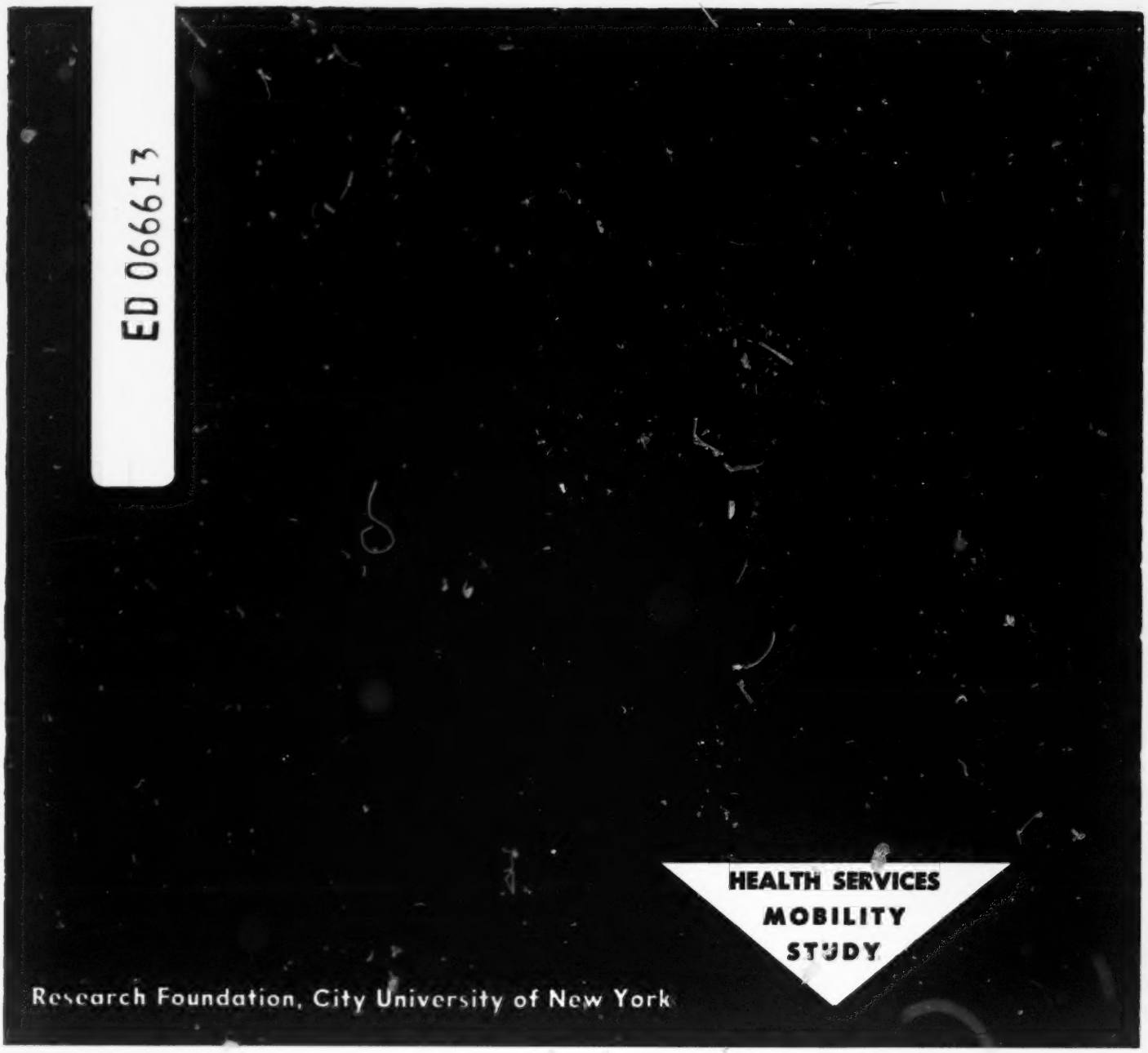

FINAL REPORT FOR THE PERIOD OCTOBER 1967 THROUGH MARCH 1972

Technical Report No. 11

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HEALTH SERVICES MOBILITY STUDY

FINAL REPORT FOR THE PERIOD
OCTOBER 1967 THROUGH MARCH 1972

Technical Report No. 11

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NOTE

The reader should be aware that this document summarizes the work of the Health Services Mobility Study during Phases I, II and III. The document is not a method manual, a fully detailed report of results, or a source of collected field data. Persons wishing more detailed information are advised to obtain the specific Research Reports referred to herein or to contact the Health Services Mobility Study.

The research reported herein was performed pursuant to: (a) a grant from the Office of Economic Opportunity, Washington, D. C.; (b) a Special Manpower Project contract with the Manpower Administration, U.S. Department of Labor under the authority of the Manpower Development and Training Act; and (c) a contract with the Health Services and Mental Health Administration, Department of Health, Education and Welfare.

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It would be impossible to fully acknowledge all the people who have been involved in Phases I, II and III of the Health Services Mobility Study (HSMS). Thanks go to the Project Officers and the Federal agencies who had faith in the Study and supported its work, and to the various consultants who contributed to the Knowledge Classification System and other aspects of the method. Special thanks go to the HSMS staff, as well, for their excellent participation in the work.

Dr. Earl E. Davis, Chief Consultant, contributed the major technical content of the methodology and was responsible for evaluating it. Irene Seifer, Senior Research Associate, was responsible for training the job analysts and leading the field work. Philip von Esch, Senior Research Associate, did much of the work on curriculum analysis and supervised the development of a Knowledge Classification System, assisted by Judy Bender, Jeffrey Koeppel and Norman Trabulus.

The field team for the pilot test included Albertine Brown, Sharon Donenfeld, Lynn Jackson, Manual Ramos and Fred Sack. Jeffrey Koeppel and Paul Corliss carried out the curriculum overlap work. Data processing was carried out by Paul Corliss with the assistance of George Squillace. Stephen I. Jasik designed some of the special computer programs which prepared the data for later factor analysis. Julia M. Caldwell and Raye Rush provided the support work.

Very special thanks go to the staff of the Dr. Martin Luther King, Jr. Health Center whose cooperation made the pilot test a success. Thanks also go to the staffs of St. Vincent's Hospital and Medical Center, LaGuardia Hospital, Montefiore Hospital and Medical Center, and the Mount Sinai Hospital and Medical Center. Our preliminary field testing was made possible by the very generous help of many wonderful people at these institutions.

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CHAPTER 1

PROJECT BACKGROUND

This document is a report on the work of the Health Services Mobility Study during three phases of its operations. These phases covered the analysis of needs and potentials for upward mobility in the health industry in New York City, the development of a systems-based methodology to create job and curriculum ladders in the health industry, a pilot test of the methodology, and the provision of technical support.

During the period October, 1967 through March, 1972, the Health Services Mobility Study produced ten Working Papers, ten Technical (Progress) Reports and six Research Reports, one of which (Research Report No. 3) includes nine volumes. Given the sheer quantity of activities, data, and documentation, there was need of a single volume which could review the activities, summarize the methods and results, and act as a guide to the documents. This report is intended to serve this purpose.

ORGANIZATION OF REPORT

This document is addressed to the reader who wants to know what the Health Services Mobility Study (HSMS) has done, and why, or who wishes to find out what is contained in the various documents which were produced by the Study up to the present time. Almost all the material presented in this report is taken from the documents already produced by the Study.

Chapter 1 presents a brief history of the Project. Chapter 2 presents a critical review of the literature covering the project's needs in

the areas of task analysis and curriculum design. (There is a selected bibliography at the end of the document.) Chapter 3 is a summary of the HSMS job analysis methodology and its approach to curriculum analysis. Chapter 4 presents a summary of the pilot test results and discusses potential applications of the methodology. Chapter 5 is a guide to the HSMS documents and outlines those that are of current interest. Chapter 6 indicates the future plans of the Health Services Mobility Study. There are two appendixes which contain material from earlier Technical Reports. Appendix A is A Glossary of Career Mobility Terms, and Appendix B is the text of a presentation about career mobility and policy made by the Director, Dr. Gilpatrick, to the National Manpower Policy Task Force.

BRIEF HISTORY OF THE PROJECT

The Health Services Mobility Study (HSMS) has been fortunate to have had the privilege of being able to develop a basic methodology for job analysis in a context which has permitted basic research,including field testing,as well as involvement in practical applications and policy. HSMS has had a research and development grant from the Office of Economic Oportunity (OEO) and contracts with the Department of Labor and the Public Health Service. It is sponsored by the City University of New York (CUNY) through its Research Foundation and the Hunter College Institute of Health Sciences. The Study's Director, Dr. Eleanor Gilpatrick, holds the rank of Associate Professor at the Hunter College Institute of Health Sciences.

Origins

Phase I of the Health Services Mobility Study was funded solely by the Office of Economic Opportunity (OEO) in a grant to the City University of New York. The purpose was to facilitate the upward mobility of workers in New York City hospitals and ways to overcome credential barriers to such mobility. The Director chosen was someone with a doctorate in labor economics and a long-term involvement in problems of employment, unemployment and structural change, as well as experience with problems of upgrading.

Phase I produced a review of the relevant literature, a survey of the attitudes of Licensed Practical Nurses (LPN's) in the Municipal hospitals towards upgrading training,and a study of the occupational structure of the New York City Municipal hospital system. Research Reports 1 and 2 cover this work. (See Chapter 5.)

Approach

During Phase I it was concluded that the health services industry is characterized by serious and growing shortages in titles and functions which require credentialed, educationally-based skill and knowledge training, with few long-term manpower shortages at the entry level. The health services industry dramatically embodies the labor market shift from goods producers to service producers and from the semi-skilled to technicians and professionals who require specific training.

While health care delivery institutions have developed internal training for their manpower needs, the new functions have been immediately

hedged with credential barriers such as licensure or certification, and professional associations have sprung up to guard the new titles, regardless of the relationship of the new functions to existing functions. As a result, there is a proliferation of credentialed health care occupations which overlap and duplicate functions. Because they are credentialed, these titles generally require formal, accredited training. The training in each case assumes no prior experience or training in health care, and, therefore, there is the problem of enormous overlap across educational programs.

The proliferation of credential barriers has not stopped institutions from adapting actual job functions to internal needs. The result of this is the fact that almost all health occupations, including aides and professionals, are at dead ends. For the individual to be mobile in this industry, the burden falls on him or her to obtain the required, often redundant training needed for entry into a new, credentialed title. The irony is that, once the individual has obtained the credentials, there is no guarantee that the required credentialed training will be relevant or fully utilized in the new institution or job.

The health industry has another bind. It seems to have been stultified by the sex images attached to the credentialed titles. In an industry in which the physician and hospital administrator is assumed to be male, and the nurse and dietary worker is assumed to be female, there has been a tendency to develop administrative enclaves in nursing and food service which run as separate entities. Many trained

female employees have had to rise to administrative levels within their domains if they were to rise at all, thus giving up the very functions that attracted them to health care in the first place.

The greatest social cost in the health industry lies in the education and training of its manpower. There are shortages of schools and shortages of properly trained skilled and professional personnel. The greatest waste in the health industry lies in the allocation of functions to personnel and in the redundancy of training requirements. It is an irony of the industry that its employment structure is shaped like a pyramid, with large numbers of semi-skilled employees at the aide level available without serious shortages, while the shortage structure is shaped like a pyramid resting on its apex, with the largest numbers of shortages near the top. This makes the industry ideal for the development of upward mobility programs utilizing the existing labor force. Yet, institutional barriers have, up to the present, inhibited the implementation of such solutions.

During Phase I the Study came to the conclusion that, while there are methods of job analysis in existence, no single method incorporates all the characteristics necessary to provide the basic data needed to design job ladders (or lattices) which can build on learnable, related skills and knowledges. The existing methods lack task definitions that are replicable and can be applied to both entry level and professional level work activities. The existing methods do not account for the knowledge needed to perform tasks, and pay insufficient attention to learnable skills, particularly intellectual and interpersonal skills.

The Health Services Mobility Study set itself the job of creating a basic methodology which would make possible the elimination of shortages through the utilization of existing manpower. It sought to minimize educational resources through the utilization of prior knowledge and experience, and thus make possible upward mobility for individuals by utilizing the skill and knowledge links between tasks and jobs. In other words, by focusing on what is learnable and transferable in the content of tasks, the investments in education could be utilized in the creation of job progressions.

The Study set itself this assignment knowing that certain key pitfalls had to be avoided. The first was that the quality of professional level service could not be distorted. The judgmental and theoretical aspects of professional service had to be respected, acknowledged and accounted for. Second, the skilled aspects of being sensitive to peoples' needs, of being responsive to the charge of caring for people's lives, health ,and well being, of being able to make decisions, see implications, and draw conclusions, all had to be respected, acknowledged and accounted for. Third, the difference between the rote performance of clinical procedures and the comprehending application of information and concepts had to be accounted for. The difference between these distinguishes transferable knowledge from non-transferable, procedural information. Finally, the work would have to be studied as it was currently being performed before there could be talk about building job ladders that would draw on prior training, and the tasks would have to be examined regardless of the titles in which they were found.

Phases

During Phase I the basic characteristics of the method were decided on and the developmental work was begun.

The Health Services and Mental Health Administration (HEW) and the Manpower Administration of the Department of Labor joined OEO in the funding for Phases II and III. Sections of early versions of the method were field tested and revised during Phase II. A preliminary task definition and several skill definitions and scales were developed. These were field tested in several major hospitals in New York City. Work on a Knowledge Classification System, which was started in Phase I, was continued during Phase II.

During this time, the Health Services Mobility Study was also developing close ties with many institutions such as the deliverers of health services, the educators of health manpower, the state and federal government agencies concerned with health manpower and/or upward mobility, and the major trade unions in the field. The Project also gained the attention of many academics. Some of the detailed field manuals were made available for use by others who understood that they were subject to revision.

Phase III ended in March, 1972. During this phase the work underwent a second major revision; general intellectual skills were identified; a Knowledge Classification System was finally produced; and a pilot test of the method as a whole was undertaken at a single institution.

Pilot Test

By March of 1971, much of the HSMS methodology in job analysis had been devised and most aspects had been field tested in discrete parts. The time had come to test the method as a system. The method needed to be applied in an institution where the results would be of interest and would cover a large enough number of job titles to provide meaningful results.

At that time HSMS was invited to test the methodology at the Dr. Martin Luther King, Jr. Health Center, which is an entity of Montefiore Hospital in the Bronx. The Center is an OEO ambulatory care community health center that has pioneered in the provision of family-oriented medical care. The senior staff at the Center were currently involved in the development of primary care practitioners in the setting of a Family Health Team. It was agreed that the Study would be allowed to analyze titles beyond those involved in the Family Health Team if it included all the titles then represented in the Team. The result was a pilot test design that included the tasks of twelve individuals in as many titles.

The twelve titles which were studied in the pilot test were as follows (in descending order by annual maximum salary):

Radiologist
Obstetrician - Gynecologist
Internist
Pediatrician
Nurse Practitioner
Lead X-ray Technician (and X-ray Technician)

Family Health Worker
Licensed Practical Nurse - Emergency Room
Licensed Practical Nurse - Treatment Unit
EKG Technician (Medical Assistant)
Treatment Unit Medical Assistant
Dark Room Aide

The pilot test was a new venture for several reasons. It was the first time that the entire HSMS system of analysis was applied to a given institution; it was the first to include physicians and to cover data on specific knowledge requirements. (The results of the pilot test are reported in Research Reports Nos. 4 and 5. See Chapter 5.)

TECHNICAL SUPPORT AND SERVICE

During the three phases of the Health Services Mobility Study the Director and staff were funded to provide technical support and service. This work is summarized below:

1. Employees of Social Development Corporation (SDC) were trained in the use of some of the methodology. It was applied by SDC in several OEO Health Centers. An employee of the University Research Corporation was also trained in and used parts of the method in other OEO Centers.

2. Family Planning Inc. (now called Family Health Inc.) received technical advice and consultation in the use of the HSMS job analysis method. They received the pilot test data collected at the Dr. Martin Luther King, Jr. Center for use in their own activities.

3. Dr. Gilpatrick has given technical support to:

   (a) The League of Voluntary Hospitals and Local 1199 on problems of mobility and job descriptions.

   (b) Hostos Community College through service on two Advisory Committees.

   (c) The Health and Hospitals Corporation of New York City through service on a task force on personnel policy.

   (d) Coalition committee sponsored by the New York City Urban Coalition which resulted in a C.U.N.Y. commitment to programs for adult upward mobility.

   (e) The American Hospital Association by service on a Special Committee on Career Mobility, of the Division of Education. The work of this committee resulted in an American Hospital Association "Statement on Career Mobility Programs" (March 12, 1971). It calls for a policy of career mobility programs in hospitals, and is being distributed by the AHA along with guidelines for establishing such programs.

4. Dr. Gilpatrick has addressed:

   (a) Division of Nursing, Bureau of Health Manpower Education.

   (b) Health Occupations Division of the American Vocational Association. (See Proceedings, 1970.)

   (c) Physician Manpower Conference sponsored by the Bureau of Health Manpower Education. (See DHEW Publication No. (NIH) 72-119.)

   (d) National Manpower Policy Task Force. (See Appendix B.)

   (e) American Hospital Association Conference on Career Mobility.

   (f) Hospital and Health Service Special Interest Group of the American Society for Training and Development.

   (g) Columbia University, School of Public Health and Administrative Medicine.

   (h) Conference on Manpower Policy sponsored by OEO, Office of Health Affairs.

5. Research Reports, Progress Reports, and Working Papers have been received by a wide readership. Many readers have either put the reported work to use or look forward to doing so. Among other uses, early HSMS manuals have provided methodological inputs to other researchers, not all of whom have acknowledged their source. Most important, however, the general approach of the HSMS has gained wide acceptance and has aided in the development of a climate for change.

CHAPTER 2

THE SEARCH FOR A METHODOLOGY

Many research projects begin with a review of the state of the art relevant to its needs; this search discloses whether new methodology must be created. Normally, the review is reported on early in the project's history. In the case of the Health Services Mobility Study (HSMS), the review was started early and then continued in stages. However, it was not reported on until Phase III. This chapter brings together the HSMS literature reviews as they relate to the development of the methodology.

THE NEED FOR A TASK DEFINITION

The HSMS goal was to devise a methodology that could be used to cluster work units statistically and then to arrange them into hierarchies that could be translated into job ladders.

The basis of the HSMS approach was partly embodied in a seminal article on occupational classification by Cain, Hansen and Weisbrod [11]:[1]

> The informational function of occupational categories clearly requires that job descriptions be codified in terms of skill requirements, and that worker-skill descriptions be codified in terms of skill capabilities. In this way the process of staffing by employers and jobfinding by workers would be facilitated. Just as standardization of size, quality, and so on, has been used effectively in commodity markets, similar gains could be achieved by the standardization of skill descriptions.

---

[1] All numbers found in brackets refer to the numbers of documents listed alphabetically by author in the appended Selected Bibliography.

> The desirability of some degree of standardization can hardly be disputed, but the difficult question is exactly what features of jobs and what characteristics of workers should be standardized. This issue is beyond our area of expertise, but we are intrigued by the possibility of using a set of quite basic or elemental skill attributes as the building blocks for classification. It would be desirable to know the level of attainment that a person has in such skills as manual dexterity of various types, the ability to get along with people, or the ability to do abstract reasoning, as well as various combinations of these skills. Occupational titles or categories would then correspond to various combinations and levels of such "elemental attributes." The particular strength of this feature is the possibility of developing a continuum of gradations of job requirements and skill attainments, and of being able to recombine different groupings to suit the needs of various users....
>
> ...The occupational classification system should be adaptable to changes that occur over time. Changes in technology and educational policy may bring about new types of jobs and different skill levels which, in turn, alter the range of substitution possibilities. An important advantage of classifications based on rather basic and elemental skills is that they could be restructured without great loss in continuity [11, pp. 51 and 52].

The achievement of such goals requires a unit of analysis which is smaller than the job so that job modifications and combinations associated with technology and related skills and knowledge could be made. It is the task.

It was determined that certain criteria for a task definition had to be met. These can be summarized as follows:

1. The definition of a task had to be able to provide data usable in the construction of job ladders, for performance evaluation, and as inputs in the design of curriculum ladders to parallel job ladders.

2. The definition of a task had to result in units which could serve administrative needs. Each task had to be a unit of work activity sufficiently self-contained to be moved from job to job or from employee to employee; the definition had to set a "ceiling" and "floor" with respect to what a task could encompass.

3. The definition of a task had to make it possible to identify task overlap across job titles or locations.

4. The definition of a task had to be applicable to any occupation, industry, or level of employment, especially professional-level and service activities.

5. The definition of a task had to be sufficiently reliable for different analysts, seeing the same work, to agree on the task units, and for analysts to agree on the sameness of task units even when they appear in different job contexts.

The first activity was to search the literature for methodological procedures in job analysis which would meet the criteria. Time and again it was found that no overall system met all the needs; however, it was possible to build on some aspects of methodology already in existence.

Industrial Engineering Definitions

Industrial engineers, in dealing with staffing problems or efficiency, use forms of job analysis. They evaluate the workers' relationships to machines and work flows. By definition, the unit of work is referenced to a production time path and is tied to existing technology. These approaches are not concerned with learnable attributes. Neither do they require reliable task definitions. Miller states this lack of interest in scientific rigor:

> ...heuristic descriptions may aspire to the rigorous characteristics of scientific description [but]...may be satisfied with much less.... Task analysis at present is a heuristic description of activities at the functional interface of the human operator and the objects and environments with which he interacts. As such, its value is proportional to its utility and economy in the design, evaluation, and operation of systems.... [49, p. 188].

Miller's definition of a task is:

> A group of unitary human operations having a common purpose, directed towards the same specific output(s), and usually occurring at about the same time or in close sequence [cited in 1, p. 13].

The engineering approach is most deficient in its ability to deal adequately with mental task activities of the type carried out by persons in health care, especially at the professional level. The use of the term "operator" rather than "performer" in the definition presented below reflects this lack.

1. The task contains an explicit goal which identifies for the operator the state or condition to be achieved as a result of task performance.

2. The task contains input stimuli representing sources of information external to the operator but to which he must attend if the goal is to be achieved.

3. The task contains a set of procedures which specify particular responses to be made to the input stimuli during task performance [72, p. 44].

The most sophisticated engineering statement may be that of Verdier; but it also exemplifies the inherent problems. Verdier defines a task as:

> <u>A limited and orderly grouping of individual human activities applied methodically to things or equipment for the purpose of satisfying some problem or need</u>.
>
> To clarify the definition; human activities in tasks are generally, but not always, <u>limited</u> to those performed by one individual within a convenient period of time, usually less than one day. These activities are <u>orderly</u>, in that they are grouped in a homogeneous manner with an observable start and completion stop. The task is comprised of elements; these are simple, discrete responses which are carried out in a cumulative and

progressive sequence. Task activities, or elements, are usually applied to, or concern, specific things or equipment. The things that task activities are applied to should be mentioned in the description of the task; as example: calibrate a voltage meter, adjust a carburetor, ship a container, counterbore a support bracket, etc. The purpose and activity of the task should also be inferred as a verb in the task description; this clarifies the problem or need for which the task is performed. In the case of the short tasks we have just mentioned, these verbs are: calibrate, adjust, ship, and counterbore, respectively [69, p. 37].

In relating the task to its component elements, Verdier expands on the definition; the orientation to blue collar work is quite apparent:

a. The element should be the most simple form of discrete activity within the task, a single stimulus-response act, if possible.

b. An element should contain the smallest observable, continuous, integrated, activity within the confines of one central idea, as example; "Remove container cover."

c. Elements are reflective of the smallest coherent action relationship between the human and the equipment.

d. The element should have an observable start and a completion stop.

e. The central idea of what is to be done within the task element should not only be clear, but should be defined on the worksheet as concisely as possible by some commonly understood verb. As example; "Remove the cover," "Read the gauge," "Insert the gasket."

f. If a single element accomplishes a task, the element may then be the task.

g. Elements are best presented on the task analysis worksheet in a logical, numbered sequence, in exactly the same order that these are carried out in the best performance of the task.

h. There should be a minimum of overlapping of the same elements within the total task breakdown.

i. Elements are best worded in the present tense, second person, and should start with an action verb; there may be exceptions, however.

j. Each element should contain some actual, observable activity; something the performer does.

Examples: Thinking about what to do is not an observable activity. Looking, inspecting, or perceiving, by itself is not an observable activity. Observing meter reading 275 lbs. is an observable activity. Waiting by itself is not an observable activity; however, waiting until the gauge reads 275 lbs. is an observable activity, as it contains a start and completion stop [69, p. 41].

Items (f), (g), and (h) provided useful insights, but item (j), by requiring that task activity be observable, was clearly not acceptable to the HSMS needs, whose emphasis is on the output being usable. Items (a) through (e) were considered to be overly rigid for HSMS purposes.

Armed Forces

The Armed Forces conduct job analysis, since work progressions are a regular part of their approach to training. However, since task inventories are used, and since generic groupings are not attempted, the definitions have remained somewhat vague. The tasks identified are always set within specific technical contexts. Morsh, Madden and Christal have surveyed the definitions. The Army and Air Force definitions are similar:

A task is a unit of work activity which forms a consistent and significant part of a duty [Air Force] [50, p. 3].

A "task" is one of the work operations that constitutes a logical and necessary step in the performance of a duty [Army] [50, p. 3].

Morsh et. al., comment that "the difficulties encountered in defining a task are similar to those found in defining a duty" [50, p. 3]. These are that "many tasks are parts of more than one duty" [50, p. 3].

The Air Force has no precise definition of "duty." It is "a large segment of the work done by an individual. It is a major part of a job," [50, p. 3]. The Army defines duty as "one of the distinct major activities involved in the work performed, or required to be performed, by the incumbent of a position. A position is made up of one or more duties," [50, p. 3].

Department of Labor

The HSMS built on the basic Department of Labor (DOL) approach and attempted to tighten its definition. The DOL definition is as follows:

> [Tasks are the] distinct major activities that constitute logical and necessary steps in the performance of a job [68, p. 1].
>
> [A task or duty is] made up of one or more elements.... It is the work unit that deals with the methods, procedures, and techniques (the "what," "how," and "why") by which parts of a job are carried out. A task or duty is created whenever human effort, in terms of one or more elements, must be exerted for a specific purpose. The effort may be physical, as pulling and lifting, or mental, as planning and explaining. The effort may be exerted to change a material or merely to maintain the status quo of a material. The material may be tangible, as boards and nails, or intangible, as numbers and words. Each task or duty has certain distinguishing characteristics.
>
> (a) It is recognized, usually, as being one of the worker's principle responsibilities.
>
> (b) It occupies a significant portion of the worker's work time.
>
> (c) It involves work operations which utilize closely related skills, knowledges, and abilities.

(d) It is performed for some purpose, by some method, according to some standard with respect to speed, accuracy, quality, or quantity. This standard may be provided by the worker himself through trial and error or as a result of experience; it may be furnished to the worker by his supervisor in the form of oral, written, or graphic instruction; or it may exist in the form of directives, published operating procedures, or similar media [67, p. 6].

[An element is] the smallest step into which it is practicable to subdivide any work activity without analyzing separate motions, movements, and mental processes involved. It is a work unit that describes in detail the methods, procedures, and techniques involved in a portion of a job [67, p. 6].

The difficulty with the DOL definition is that the four "distinquishing characteristics" include words and concepts which are broadly stated and not themselves defined. While most of the basic distinctions for task and element are useful, the definition does not provide an operational framework setting "floor" and "ceiling" limits on task size.

Sidney Fine's Functional Task Analysis

Dr. Fine, who was at the Department of Labor before doing independent work at the Upjohn Institute for Employment Research, was involved in early work in the field of task analysis. His original definition recognizes the importance of technology and mental and interpersonal activity, but does not provide a reliable guide for dividing up the work activities carried out by a given performer:

A task is an action or action sequence (physical, mental, or interpersonal) conveniently grouped through time, beginning and ending with identifiable actions, directed at achieving a specified end result. A task is meaningful within the context of a technology. It is performed according to standards derived from the purposes of the technology on things, information-ideas, and/or people. Tasks are similar to the extent that component work actions are similar [cited in 19, p. 42].

A later definition is as follows:

> A task is the smallest unit of activity, performed by man and/or machines, which makes an immediate contribution to the subsystem objective, and for which functional levels and orientation can be clearly established. "Tasks" are distinguished from "actions" which describe the task's methodology (i.e., motions and operations which are optional for achieving the objective) [19, p. 42].

This later definition reflects Dr. Fine's focus on the relationship between the task and organizational goals. While there is still no "ceiling" or "floor" to the definition, it does recognize that in some tasks particular motions and operations are or can be optional. The HSMS definition provides for options in the task definition by including as elements the range of methods or materials which are chosen among, and by accounting for the act of deciding or choosing as a separate task or as an element.

The "New Careers" Definition

The "new careers" approach is largely based on Dr. Sidney Fine's method [19], and itself adds little to the field:

> [A task is] a separate and distinct part of a function requiring some physical or mental energy related to a specific purpose. To the extent possible, it is best to describe tasks in behavioral terms to more clearly depict what activity is to be performed to accomplish the task [38, p. 5]. [A function is] a group of tasks which are similar in nature. When expressed in behavioral terms, (for example, in the job description), the subject matter changes but not the behavior. A function therefore might include many individual tasks [38, p. 5].

American Institutes For Research Nursing Study

A series of documents produced by the American Institutes for Research provided HSMS with several important insights about tasks.

In one document, the "task" or "activity" includes all of the steps involved in accomplishing a task assignment, from its instigation to its completion [43, p. 7]. "The sequence of steps [are] divided into four 'stages': preparation, execution, follow-up, and recording" [43, p.9].

The HSMS uses a modification of the approach and includes all the steps needed to be performed by the same person to achieve an output. The approach made it possible to recognize that tasks as well as elements could be classed as "preparation, execution, and termination" (HSMS terms).

A later statement of the definition coincides with the HSMS emphasis on judgment, choice, and non-tangible aspects of task activity in service occupations:

> ...a task is a product which can be evaluated as acceptable or not, even when there are no independent standards to use in assessing the behaviors necessary to accomplish the task [44,p.3].

It was concluded that, while there are methods of job analysis in existence, the existing methods lack task definitions that are replicable or that can be applied to both entry level and professional level work activities. The HSMS proceeded, therefore, to develop its own definition and to field test it. Chapter 3 presents the HSMS definition.

THE NEED FOR SKILL SCALES

The HSMS job analysis method is based on the premise that, if the jobs in a ladder (upgrading sequence) are arranged to reflect rising levels of related skills and knowledge (education), the educational costs

and training time between each step on a ladder can be kept to the minimun needed to bridge the gap between the jobs. This would be far less than that required to train for each job "from scratch" or for job sequences unrelated in skills or knowledge. For this reason, job tasks are the basic unit of observation and are evaluated in terms of the levels of the learnable skills (and knowledges) required for their performance. These skills and knowledge categories can then be treated as statistical variables and can be used to cluster tasks into related hierarchies. From the point of view of HSMS objectives, the skills needed for the method must have the property of being learnable, because all the rungs on the job ladders must be reachable through training and education.

From a statistical point of view, each skill variable must have certain properties:

1. The skill scale must have levels which are unidimensional, cumulative, and have reliable values. In other words, the skill must be able to be described as a scale.

2. The skill scale must have adequate inter-rater reliability, since the clustering must represent regularities in the relationships among the scales.

The attribute of scalability requires that the skill must be found to be applicable (or must be identifiable) over a full range, from low to high levels. The attribute of unidimensionality requires that the same skill be present at each level, but in increasing degrees. The attribute of cumulativeness requires that lower levels of the skill be present in all higher levels on the scale, and that higher levels not be

present in lower levels. The attribute of reliable values means that independent observers can agree on the values assigned to any descriptors used to represent levels of the skill on the scale. Inter-rater reliability means that different raters who have common training and experiences will independently agree on the scale values to assign to the same observations.

It was found that a good deal of the literature confuses skills, aptitudes and knowledge. The confusion arises because worker abilities, which are a "supply" concept, are confused with technical, production requirements, which are a "demand" concept. This distinction is made by Cain, et al:

> [Classification of jobs] from the employers' standpoint...depends on the technical production function, which specifies the extent to which factor substitutions among types of labor are possible....classification from the workers' standpoint...the substitutability of one job for another[,] depends on workers' preferences along with their abilities to perform various tasks [11, p. 50].

The quotation from these authors, presented earlier, indicated that they recognized that it should be possible to isolate, identify, and describe skills in a manner free of reference to any specific industry or occupation. Were this possible, they felt, new job requirements could be reflected through references to the more generic skill categories in varying combinations. It was not clear, however, whether the authors were distinguishing between skills and knowledge.

The review of the literature indicated that "skills" are not dealt with consistently, since they are often confused with aptitudes, are not always limited to being learnable, and are often treated as interchangeable with knowledge [1, 8, 11]. Sometimes skills appear in a melange of human abilities and skills in the concept of "human factors" [22, 69]. Job attributes to be assigned monetary values, such as for wage and salary administration, are sometimes also called skills [53].

Though "skill" and "aptitude" are often used interchangeably, Seashore indicates the distinction used by the HSMS. Thus, aptitude is an "individual's probable rate, or possible ease, of learning a skill" [55, p. 1343]. The concept that skills are learnable through training and practice can be found in the work of Guilford [31] and Fine [19, 21]. Guilford most influenced the HSMS work on General Intellectual Skills. The Department of Labor and Fine influenced the overall direction by providing an initial starting point in the "people, data, things" worker-function scales and the General Educational Development scales for reasoning, mathematics, and language. These scales are found in Dr. Fine's method [19, 20], and in the Department of Labor's job analysis approach [66, 67, 68].

The chief reasons for building on but not using the Fine scales are that they are obviously multidimensional and clearly not cumulative, two conditions that were needed if multivariate analysis was to be employed. The scales are also somewhat task specific, and are not sufficiently generic to be present in and scalable across all job levels.

The decision was to use the literature review to help focus on particular types of skills. As a result, the work on skill scales evolved in six broad areas covering manual skills, interpersonal skills, language skills, general intellectual skills, decision making skills and skills of responsibility reflected in consequences of errors. Chapter 3 describes the skill scales.

The literature was most rich in the area of manual skills (perceptual-motor functions). However, much of this literature focuses on aptitudes, and therefore confuses performance standards such as speed and accuracy with actual skills such as guiding and steering or object manipulation. The decision was to review the literature in which the motor functions were subjected to factor analysis and/or there were descriptions of the behaviors being tested [23, 24, 25, 26, 27, 28, 35, 55], to isolate the most stable factors,and eliminate those reflecting speed or accuracy.[2]

Object Manipulation, Object Placement, Guiding or Steering, and Locomotion were thus extracted. Later field work with Figural and Implicative skills and the unreliability of some of the early HSMS scales suggested that Object Placement be eliminated and that Guiding or Steering should be more limited in its reference.

In dealing with interpersonal interaction skills, the HSMS staff itself produced some important insights. They suggested that thera-

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[2] A similar analysis was being made by Parker, et. al. [54],but they were looking for abilities, and did not exclude speed or accuracy.

peutic interaction was no different from non-therapeutic interaction with respect to skill, but rather differed only with respect to motivation. For that reason, the four original interpersonal interaction skills (Therapeutic, Non-therapeutic, Co-worker Cooperation and Leadership) were combined into two skills (Human Interaction and Leadership).

The content of the language skills was clarified once it was understood that the Knowledge System would deal with vocabulary and grammar. The three scales relate to precision in the choice of language. Originally, there were four language scales; testing disclosed such a high correlation between Comprehension of Spoken Language and Oral Use of Language, that the two scales were made one. Combination was not warranted with Reading and Writing skills. Logically, one expects these latter skills to be needed independently, depending on task circumstances.

It had long been considered necessary to deal with intellectual skills as well as manual and interpersonal skills in the methodology. At first one skill was conceived of: General Intellectual Development. It was to be contrasted with General Educational Development, and refer to an intellectual capability that develops as knowledge is attained, but is independent of specific knowledge content. It soon became clear that the concept was multidimensional, and that several skills were involved.

The literature in the field dealing with intellectual activity addresses itself largely to aptitudes. The General Educational Development scales of the Dictionary of Occupational Titles [66] are a melange of task descriptions, aptitudes, and untested concepts. The scales by no

means isolate knowledge-free skills and were not tested for the qualities of equal intervals or cumulativeness. There is a basic body of work developed by J. P. Guilford [31] which deals with intellectual skills. This served as a conceptual framework and was modified for HSMS needs.

Guilford indicates that intellectual skills are learnable:

> There is no doubt of the strong correlation between amount of formal education and development of intellectual abilities.... [31, p. 459].
>
> The choice of curriculum should give attention to opportunities that different courses and subject matters have for development of the general skills as well as for their more immediate and special utilities [31, p. 476].

The job was to find those intellectual skills which are identifiable in the world of work and are learnable after usual levels of development have been reached. A field program was designed to determine what the dimensions might be which would cover General Intellectual Skills (GIS) and which would be learnable, free of specific content, and scalable with respect to task requirements. The results were four skill scales which refer to a limited number of mental skills which a performer may use in a task and which are transferable across subject matter categories.

The decision making and error consequences skills reflect the work in job evaluation [53] in which "responsibility" is so often considered to be a job attribute. The HSMS approach was to differentiate among responsibility skills needed to cover (1) the situation where the performer has a choice of methods of performance; (2) decisions about the level of quality at which he will perform; (3) skills involving an aware-

ness of the financial consequences of error; and (4) the awareness of the danger to humans as a result of an error in job performance.

The Labor Department approach, which recognizes responsibility, job knowledge, mental application, dexterity and accuracy [67] is a precursor of the HSMS Decision Making and Error Consequences scales, the Knowledge System, the General Intellectual Skills, and the HSMS manual skills. Accuracy is dealt with in performance evaluation, but may also be reflected in Decision Making on Quality. Chapter 3 discusses the HSMS skills.

THE NEED FOR A KNOWLEDGE CLASSIFICATION SYSTEM

Given that the aim of the HSMS task analysis method is to minimize the educational or training distances between jobs in job ladders, it was obvious that it would pay attention to knowledge as well as skills. The more that tasks require academically based, or advanced, or specialized knowledge, the greater the investment needed in education and training to carry them out.

It was decided that the HSMS classification system must categorize knowledge independently from any specific task applications; that knowledge must be identifiable at the level of the task; that categories must be uniquely found and numbered in the system, and must be arranged into hierarchies (outline form). Each category was to be scalable at every level on a common Knowledge Scale, and the entire system was to give priority to the way knowledge is used in the world of work.

After investigating various possibilities, it was decided that the Universal Decimal Classification System (UDC), a library classification system, offered the closest approximation to the basic structure required [9]. However, the results of an early field test convinced the staff that it would have to develop its own system, since even a revised UDC fell short of too many of the needs, either conceptually or for statistical reasons. Chapter 3 describes the HSMS System.

THE NEEDS OF CURRICULUM ANALYSIS

The purpose of curriculum ladders is preparation for occupations which may be reached through exit points along the way. Each component program would be preparation for the job at the next exit point, but also would be cumulative preparation for the still higher-level exit points to be reached after further education.

Since the emphasis is on additive (cumulative) occupational education, any analytic model must be able to deal with traditional academic curricula such as English, Social Sciences, Natural Sciences, Mathematics, etc., and must also be able to deal with clinical curricula which present the procedures which are to be carried out in the performance of the tasks of an occupation.

These distinctions are complicated by the fact that some clinical training incorporates and applies academic training, while other clinical training can only be learned and carried out as specific procedures. In addition, some information can be learned equally well in an academic or in a clinical setting.

The design of curriculum sequences, the attempt to eliminate overlap or redundancies, and the attempt to eliminate unnecessary curriculum content all require a unit of analysis on which analysts can independently agree. This means that the curriculum unit must be operationally defined. It means that, given a course of study, different analysts using the same definition will fairly closely agree on the identification of the curriculum units involved and so that it will be possible to differentiate two curriculum units which may deal with similar subject matter but at different levels of comprehension or abstraction. The unit must make it possible to identify as the same, two curriculum units which refer to the same content and level of subject matter, regardless of the institutions or courses in which they are taught or the settings in which they are demonstrated.

Since very few authors in the field of job analysis set out to build job ladders accompanied by curriculum ladders, there was little hope that the same authors would offer an operational curriculum unit definition. The hope was that someone could be found who had bridged the gap between job analysis and curriculum design in one of the three somewhat overlapping areas of job analysis, learning theory, and curriculum design and development. (The latter two fields include the more specialized areas of educational objectives and individualized learning.)

The inherent problems posed earlier were sensed and stated in a similar way by Haggard [32] and Levin [46]. Levin et al., pose the overall objectives as follows:

> The job-oriented curriculum starts practically and conceptually at the beginning entry-level skills. The career-oriented curriculum, however, starts conceptually at the professional level, analyzes the knowledge and credit needed to reach that level, and then distributes the results of that analysis down through each rung of the career ladder [46, Volume II, p. 48].

The Levin project developed some basic core curricula. However, the project did not develop a curriculum unit definition which could be used for curriculum analysis. The Haggard study [32] raised the types of issues which HSMS had become aware of, but offered no solutions.

The field of job analysis generally avoids the problems of defining the curriculum unit by dealing with the tasks of a sub-professional per se, as curricula [5, 12, 19], or by not dealing directly with the problems of knowledge and curricula in the context of curriculum ladders [17, 39, 51, 58], or by dealing largely with frequency of occurrence as the area of concern [13, 70], or by not attempting to extrapolate beyond a limited area of attention [1].

While much conceptual thought about learning, educational objectives and curriculum design could be gotten from the leading scholars in these fields [3, 4, 6, 7, 10, 29, 37, 40, 41, 45, 48], very few link the educational objective with the world of work. One of the few writers who does is J. P. Guilford [31] whose influence is manifested in the four HSMS General Intellectual Skills. However, though the link is suggested, no unit of curriculum analysis is provided.

In the area of curriculum design it first seemed possible that the term "module" might be conceived of as "building block" and provide

a useful unit of analysis. However, the literature suggests that the curriculum module relates to the problems of flexible scheduling and individualized education [52, 62, 71], particularly computer applications [61]. The module is an event arranged in an ordering of educational behavioral objectives, and has more of a time framework than an operational definition which deals with the size of educational content.

The concept of building blocks is reflected in Gagné [29], while Bruner's work [10] places emphasis on the grasping of relationships. Both reinforce the HSMS view that rote teaching of procedures provides the least transferability.

It was concluded that the literature in curriculum design, learning, and job analysis provided no overall system that met HSMS objectives. However, a conceptual base on which to build was found in the literature on educational objectives. Here is offered a behavioral orientation to curriculum analysis which corresponds well to the task orientation of job analysis. The conceptual framework is relatively clear and is oriented towards replicability. The work of Beauchamp [6], Kibler [40], Krathwohl [45] and Mager [48] offered a context in which the curriculum unit could be operationally defined and developed to meet the HSMS requirements.

Behavioral Objectives

The literature on behavioral objectives acknowledges the larger purposes of curriculum design and specifies that the elements applicable

to curriculum design be consistent with educational objectives [6]. The elements are conceived in terms of the activities which must be displayed by the learner in order to demonstrate that the learning has taken place. As a result, the content learned, the application of the content, and the method of presentation are functionally related in the original conception of the curriculum. The educational objective and the curriculum are translated into behavioral objectives.

Behavioral objectives, as used by educators, are expressed in statements which indicate what learners are expected to or will do on successful completion of a prescribed unit of instruction. The statements communicate the goal(s) of the unit of instruction to the learner who embarks on the learning process; they communicate to instructors who must also deal with preceding and/or following units; and they communicate to the curriculum analyst and planner who designs the sequences of the units.

Statements of behavioral objectives are now in growing use in the field of education and are applicable to all levels of education from the elementary to the college level. While the operational definitions of behavioral objectives as units of analysis have not been developed, there is a body of literature which deals with the criteria for creating behavioral objective statements. This literature became the source for the HSMS curriculum unit definition, which is presented in Chapter 3.

NEEDS IN PERFORMANCE EVALUATION AND TRAINEE SELECTION

The field of manpower training, planning,and development has long reflected the need for work-related bases for evaluation of an in-

stitution's performance in the delivery of specific outputs (health services or others), and for evaluation of employee performance. With the rising emphasis on upward mobility and upgrading training, there has been a growing need to develop a basis for trainee selection that may be more relevant, or less in need of continuous validation than the use of aptitude tests or the very general categories used in current supervisor ratings.

The Supreme Court has decided that employers who rely on basic intelligence and aptitude tests in hiring and promotion can be guilty of discrimination in terms of the provisions and intent of the 1964 Civil Rights law. The Court requires that "any tests used must measure the person for the job and not the person in the abstract." It held that, "if an employment practice which operates to exclude Negroes cannot be shown to be related to job performance the practice is prohibited," (Griggs vs. Duke Power Company, 1971).

This ruling, placing the entire field of aptitude testing into doubt, points up the major problem of aptitude testing. By virtue of being abstracted from job performance, the aptitude tests are suspect with respect to content validity, and, by extension, are less likely to have predictive validity (ability to predict future success).

The major difficulty in obtaining satisfactory measures for predicting success accurately (predictive validity) lies in the nature of the variables which are used to make the predictions. In almost all of the studies reported in the literature on work performance, the predictor variables are derived from traditional paper and pencil aptitude

tests. These were only presumed to be related to work performance.

Even if these traditional aptitude tests possess some abstract content validity, the qualities they measure are usually rather global in nature. They attempt to tap general areas of aptitude and thus are not likely to predict success criteria which are specific to a particular job.

A more serious shortcoming which has been increasingly recognized in recent years is that aptitude tests have widely differential predictive validites for different individuals. Educational background, socio-economic status, race,and other demographic characteristics are among the considerations which may affect the results. Kirkpatrick, et al. [42], for example, have shown in a series of studies that aptitude tests may have differential predictive validities for members of different racial and ethnic groups.

In one study reported by these authors, students in all-white and all-Negro nursing schools were matched with respect to location, on type of academic setting, and on the fact that they were all in accredited institutions. The subjects were presented with a standard predictor battery consisting of the Pre-Nursing and Guidance Examination (PNG) developed by the National League for Nursing. The success measures (criterion variables) consisted of scores on the State Licensing Examination for nurses, classroom and clinical ratings, and termination rates.

Although the white nursing students performed better on the predictor measures, there were no consistently significant differences

between white nurses and Negro nurses on the criterion variables. Thus, the predictor battery, which was designed to tap aptitude for nursing, showed predictive validity for white nursing students, but showed no significant predictive validity for Negro nursing students. Had this predictor battery been used as a basis for selecting Negro candidates for acceptance into nursing training, it would have unfairly discriminated against many Negro candidates who, although they might have scored low on the predictor battery, might well have performed quite satisfactorily on the criterion variables.

The Health Services Mobility Study undertook to develop methodologies for performance evaluation and trainee selection which could produce predictor variables based on data collected by use of the HSMS methodology. These would be derived from scales based on current performance in concrete, operationally defined skills and knowledge categories, in tasks which had been empirically demonstrated to be related to the kinds of tasks to be performed in the target job. Such instruments should have much higher predictive validity coefficients than are normally obtained when using aptitude measures as predictor variables. The HSMS Trainee Selection Instruments would be based on actual work performance ratings in the current job and not on paper and pencil measures which can be culture-bound or unrelated to performance in the target job. This work is reported in Research Report No. 6 and is referred to in Chapter 5.

CHAPTER 3

SUMMARY OF THE HSMS METHODOLOGY

This chapter presents the highlights of the HSMS job analysis methodology, discusses its use in the creation of job ladders, and describes the HSMS curriculum unit.

THE TASK

The definition of a task in the HSMS method is designed to result in a unit of work which can be moved from one job to another without disrupting other activities. The task is a unit of work which is smaller than that of a job as a whole or, in most cases, than that needed to produce an entire product such as a health service or a manufactured item. The task reflects individual work activities which, in many cases, will be steps leading to or assisting in the production of a final product. The task relates to the performer's output rather than the institution's product. (Products are the units which are sold.)

The task is composed of elements. The element is smaller than the task and is involved in defining the task. The elements of a task are the smallest possible meaningful units of work resulting from physical and/or mental activity. In contrast with the task, elements do not have identifiable, usable outputs which can independently be consumed or used, or which can serve as an input in a further stage of production by an individual other than the performer. A task is identified as follows:

1. The output of a task is the result of an independent stage in a production process in the context of the current organization of work activities in the institution.

2. "What is used" in a task includes all the things which the performer is expected to be able to use or choose from to produce the identified output.

3. The kind of recipient, respondent or co-worker involved in a task reflects the characteristics or condition of the persons involved which determine the knowledge needed on the part of the performer in dealing with them.

4. Individual tasks are identified through the combining of information on output, what is used, and the recipient, respondent or co-worker in a manner compatible with the task definition. Individual tasks are differentiated or judged to be duplications or overlaps of each other based on these data.

The HSMS Definition of a Task

A task is a series or set of work activities (elements) that are needed to produce an identifiable output that can be independently consumed or used, or that can be used as an input in a further stage of production by an individual who may or may not be the performer of the task. The definition is further elaborated as follows:

1. In principle, someone other than the performer of the task must be able to use or consume the output of the task.

2. Theoretically, it should be possible for there to be an elapse of time between tasks.

3. A task includes all the possible conditions or circumstances which a single performer is expected to deal with in connection with a single production stage.

4. A task includes all the elements that require continuous judgment or assessment by the same performer in order to assure the quality of the output.

5. A task includes all of the elements needed to produce an output which can be independently used or acted upon without special explanations to the next performer in the next stage of production.

6. A task includes all the elements needed to complete an output to a point at which another performer (who would continue with the next production sequence) would not have to redo any elements in order to continue.

7. A task includes all the elements needed to complete an output to a point at which another performer, in order to continue with the next stage of production, need not perform extra steps.

8. The task must not require that, for another performer to continue with the next stage in a production sequence, current institutional arrangements would have to be changed.

9. A task must be sufficiently broad in statement that it can be rated on its frequency of occurrence.

10. Two tasks are the same if their elements result in the same output, require the same things to be used (including the alternatives to be chosen among in what is used), and if the kind of recipient, respondent or co-worker involved is the same in terms of what the performer needs to know in order to deal with the person.

The HSMS task definition permits the acknowledgment that much professional level training is used primarily for the emergency or contingency situation, but must nevertheless be accounted for in the task's identification. For example, the task of delivering a baby through the vagina (normal delivery) must contain elements including the decision that complications warrant a change of procedure (such as to Caesarian section),the choice of anesthetic, and the possibility of responding to cardiac arrest -- if the performer of the "normal" delivery is the one who must deal with these contingencies.

On the other hand, the definition permits the identification of a task in which the performer notifies a higher level performer of any emergency signs. Thus, the latter task could include only normal delivery and the reporting of complications. The reader will note that these are two different tasks because they require different skills and knowledges, have different outputs, different methods, and involve different co-workers.

Figure 1 is an example of the Task Identification Summary Sheet used to collect task identification data. The List of Elements, found in the right-hand column, describes the elements of the task in detail, and is presented in the sequence in which they are performed. The elements include initiating and terminating actions and any decisions, record keeping,or delegation of duties which are part of the task. In a complicated or high level task the List of Elements can be long and is continued on additional pages. Some tasks have taken as many as six pages.

A narrower level of detail is found on the left-hand side of Figure 1. Items 1, 2, 3 and 4 cover the output, what is used, and the recipient, respondent or co-workers involved in the task.

A still narrower level of task detail that also provides a fairly full description is found in the "Name" of the task. This is item 5 on Figure 1. The "name of the task" is actually a paragraph that summarizes the essential features of the task.

Figure 1. EXAMPLE OF TASK IDENTIFICATION SUMMARY SHEET

Performer's Name_____ Analyst(s)_____ Dept._____
Job Title_____ Institution_____ Date_____

1. What is the output of this task? (Be sure this is broad enough to be repeatable.)

   Sutures removed from wound; healing evaluated; medications, bandages ordered or prescribed as needed; recorded.

2. What is used in performing this task? (Note if only certain items must be used. If there is choice, include everything or the kinds of things chosen among.)

   Patient's chart, pen;
   antiseptic, gauze; sterile gloves;
   suture scissors;
   forceps or tweezers; clamps (sterile);
   towels,
   tape, bandages, medications;
   institutional prescription form

3. Is there a recipient, respondent or co-worker involved in the task? Yes...(X) No...( )

4. If "Yes" to q. 3: Name the kind of recipient, respondent or co-worker involved, with descriptions to indicate the relevant condition; include the kind with whom the performer is not allowed to deal if relevant to knowledge requirements or legal restrictions.

   Patient needing sutures removed;
   subordinate (RN, LPN, Medical Asst.);
   adult accompanying child patient

5. Name the task so that the answers to questions 1-4 are reflected. Underline essential words.

   Removing a patient's sutures using antiseptic, clamp, scissors, forceps; evaluating healing; deciding on ordering antibiotics, medication, irrigation and/or bandaging; recording on patient's chart.

6. Classify the type of task:
   Preparation ( ) Execution(X) Termination( )

7. Check here if this is a master sheet..(X)

List Elements Fully

Performer may have decided to remove patient's stitches after having done the suturing originally, or patient may have been referred to performer for removal of stitches.

1. If appropriate, reviews patient's chart. May decide to delegate removal of stitches to RN. If so, gives orders.
2. Orders materials needed from subordinate.
3. Examines skin to note appearance of healing.
4. Explains to patient and/or adult what is to be done. Comforts patient.
5. Puts on sterile gloves. Sterilizes area with antiseptic and gauze.
6. Uses clamp to hold up stitches; cuts sutures with appropriate scissors. Pulls out sutures with forceps or tweezers.
7. Examines wound for signs of infection. May decide to irrigate with antiseptic or order wound irrigated.
8. May decide to prescribe antibiotics and explain to patient and/or adult how to take, or will administer or have subordinate administer. Writes and signs prescriptions.
9. May dress and bandage or have subordinate dress and bandage, specifying what to use and any medications. May order follow-up examination.
10. Enters record of what was done and any medication prescribed on patient's chart.

SKILLS

A skill, in the context of the HSMS method, is displayed in action, in the carrying out of a mental or physical activity; it can be rated in terms of its degree or its level. Knowing how or why things function or what to do to things to make them work is knowledge. Using the knowledge requires skills. That is, one may know how something works, the principles of why it works, or what to do to it to make it work, but one needs skills in the act of applying the knowledge in a job task.

The critical distinction between skill and knowledge, given that they are both treated as learnable, is that knowledge is learned through didactic instructional means. Skills require practice if they are to be learned. Skills may first be presented in an instructional setting such as in a classroom or lecture room, but actual learning does not take place until there is practice. For example, a student nurse can learn the principles and mechanics of giving injections in a lecture setting. She is learning "introductory procedures." However, in order to actually give an injection she must learn and use manual, manipulative skills. These are developed in the course of giving real or simulated injections. As anyone who has ever had black-and-blue injection sites knows, the best injection techniques require a great deal of practice if they are to be done properly.

The literature in the area of performance evaluation, job analysis and testing often treats the concepts of "skill" and "aptitude" as

synonymous. For HSMS operational purposes they are distinctly different. The term "aptitude" is used to denote a person's capacity to acquire a skill. It refers to the ease with which an individual can learn a skill or the level of performance he can ultimately achieve in exercising the skill. For example, an individual can be taught the manipulative movements necessary to play a tune on the piano. Through practice he can acquire the skill of playing the piano. The ease and speed with which he learns, and the eventual qualitiy of his playing, however, is a function of his aptitude for music, covering both the knowledge and the skills involved in playing.

The HSMS method identifies sixteen learnable skills and a scale for Task Frequency. Of the skills, three are manual; two are interpersonal; three relate to precision in the use of language; two deal with decision making; four cover general intellectual skills; and two are responsibility skills which relate to the recognition of the consequences of error in task performance. Each of the skills is represented by a scale.

Scales

Each of the HSMS scales has a name, an overall statement of its content, and an indication of what criteria (scaling principles) are to be used to differentiate each of its various numerical levels. Each numerical scale value (which can range from 0.0 to 9.0) is accompanied by a statement (descriptor) which describes the behavior warranting that de-

scriptor's scale value. The descriptors use generic language, so they can be used for any task, in any industry.

The first descriptor for each scale is at the zero point. The descriptor at zero contains more than the simple statement that the particular skill is not involved. Each suggests the necessary minimum condition which must be met before a task can be rated above zero on the scale. The minimum conditions for non-zero levels of the skill scales describe levels above expected, common behavior attainable with maturation. This is true for each zero point descriptor for each skill. Thus, the zero point descriptor assures that non-zero levels of the skills represent learnable attributes that are worth considering for clustering tasks and for designing curricula.

For each scale the minimum condition represents the key aspect of a quality which must be present. This quality and one or more additional qualities determine the way in which the levels of the scale rise. Each descriptor represents a level described in terms of the scaling principles involved. In some scales more than one principle is involved. The descriptors for the scale represent combinations of the levels of the principles which can be expected to be found in work situations.

The HSMS Skill Scales

Figure 2 presents an example of one of the HSMS skill scales. The reader will note that it has a name, an introductory statement about its content and scaling principles, and a series of numbered descriptors.

Figure 2. THE HUMAN INTERACTION SCALE

This skill refers to the degree of sensitivity to others required of the performer in the task being scaled. The skill involves the performer's perception of the relevant characteristics or state of being of the other person(s), the performer's attention to feedback as the interaction occurs, and the performer's appropriate modification of his behavior so as to accomplish the task. The skill is involved if the task requires any personal contact or interaction with others. The scale value of this skill rises as the degree of perceptiveness and sensitivity required of the performer rises, and as the subtlety of the feedback to which he must respond increases.

The level of this scale should not be determined by the level of knowledge required in the task.

SCALE VALUE	DESCRIPTIVE STATEMENT
0	The task does not require the performer to be in contact with or to interact with other people.
1	The task requires the performer only to be in general contact with other people. Very little sensitivity or awareness of feedback is required other than the need to take account of them in the performance of the task.
-	
3	The task requires the performer to interact with others in the performance of the task. The performer is required to be somewhat sensitive to the other person(s)' relevant general characteristics or state of being,and to be aware of very obvious feedback so as to adjust his behavior accordingly.
-	
5	The task requires the performer to interact with others in the performance of the task. The performer is required to be quite sensitive to the other person(s)' relevant characteristics or state of being, and to be aware of fairly obvious feedback so as to adjust his behavior accordingly.
-	
7	The task requires the performer to interact with others in the performance of the task. The performer is required to be keenly sensitive to and perceptive of the other person(s)' relevant characteristics or state of being, and to be aware of fairly subtle or complex feedback so as to adjust his behavior accordingly.
-	
9	The task requires the performer to interact with others in the performance of the task. The performer is required to be keenly sensitive to and perceptive of the other person(s)' relevant characteristics or state of being, and to be acutely aware of very subtle or very complex feedback so as to adjust his behavior accordingly.

The scale value of the descriptors for each scale and the actual number of descriptors used in the scale was determined by a statistical procedure called "equal appearing intervals," or Thurstone Scaling. Each scale was also designed to be self-evidently cumulative; that is, each scale level encompasses all the scale levels below it with respect to the skill involved.

The HSMS method identifies three manual skills which appear to be learnable through practice. They each deal with precision and coordination in the use of the body or its parts, and are essentially psychomotor skills. Locomotion deals with the body's movement through space; Object Manipulation deals with the movement, control and placement of objects, and Guiding or Steering deals with the control of objects moving in space in relation to external stimuli. All three are needed at non-zero levels once the task requires that some sort of predentermined standard be achieved.

The HSMS method includes two interpersonal skills. One deals with Human Interaction (Figure 2). It is exercised whenever a task requires the performer to come into contact with, or interact with, other persons. The second deals with Leadership, and is exercised whenever a task requires the performer to relate to subordinates so as to influence their work behavior. These two scales have scaling principles which describe conditions under which the skill must be exercised, rather than the way the skills are manifested or the nature of the skills. This is because

interpersonal skills may be exercised in ways that are unique to the performer, and reflect his individual personality. However, the skills do require behavior which can be learned by being practiced, regardless of the specific manner in which they are displayed. Thus, the levels of the skills, as called for in tasks, are a basis for task clustering.

There are three HSMS language skills. The language skills deal with the precision with which the performer uses language to convey meaning, independent of the knowledge he must have in order to use technical vocabulary. The language skills do not refer to knowledge of vocabulary. (Technical language is accounted for by the knowledge categories identified for the task.) The language skills also do not refer to knowledge of grammar, semantics, linguistics or literary form. As with any other skills, the language skills are learned through practice. The language skills cover Oral Use of Language, Reading Use of Language and Written Use of Language.

The HSMS method treats decision making responsibilities as decision making skills. The exercise of responsibilities may involve any number of other skills, but having to exercise the responsibilities, the fact that tasks require decisions to be made involves use of decision making skills which can be learned through practice. There are two decision making skills. Decision Making on Methods is relevant for any task except when the output is achieved in a totally pre-determined fashion so that the performer exercises no choice over methods whatsoever. Deci-

sion Making on Quality is applied to any task,assuming generally correct performance,whenever the performer can have some effect on the quality of his output.

The four HSMS General Intellectual Skills are called Figural Skills, Symbolic Skills, Taxonomic Skills and Implicative Skills. They cover task behavior such as dealing with the size, shape,or form of things to achieve a figural standard; the mental manipulation of abstract symbols which are parts of systems of notation; the conscious application of, or creation of, conceptual classifying or organizing principles; and the drawing of non-obvious conclusions or inferences from information. These skills are learnable through practice and transferable from one task situation to another. Since General Intellectual Skills are usually learned and exercised in the application of knowledge, they can be confused with knowledge. But the knowledge actually serves as a vehicle through which the skills are learned and practiced. Thus, tasks which require diverse knowledge or subject matter may have in common some of the General Intellectual Skills necessary to apply the knowledge, and the skills are valid for use in clustering tasks.

Every task normally carries with it the danger that the performer will make errors in carrying it out. The performer's awareness of the seriousness of possible errors serves to keep him alert in the performance of the task. This sense of responsibility is learnable, and, as such, is treated as a skill on the basis of which tasks can be clustered. The HSMS method includes two such skills. One deals with the Financial

Consequences of Error; the second deals with Consequences of Error to Humans. Both scales describe levels of seriousness of the consequences of an error considered to be the most serious, likely error for the task that can be made by a performer qualified to do the task.

THE KNOWLEDGE CLASSIFICATION SYSTEM

The concepts and definitions used for the HSMS Knowledge Classification System and its Knowledge Scale reflect the method's need to treat knowledge categories as variables which can be uniquely identified regardless of task and which can be treated as scalable in a manner similar to the HSMS skills.

Knowledge is information about facts and concepts and includes how or why things function or what to do to have them function. Knowledge may be acquired by formal didactic means such as in a classroom, or by less formal means such as self-study, personalized instruction, or by watching others.

The definitions and the categories which are part of the HSMS Knowledge Classification System reflect the uses of knowledge in work settings. The groupings of the categories reflect their functional uses. The categories were conceived of and devised to be additive and scalable in the same way in which the HSMS skills are additive and scalable (rising from low to high levels cumulatively, according to scaling principles). The categories require the effort of being learned in the context of a curriculum, and they can be applied in more than one setting.

The concept of the transferability of knowledge assumes that some kinds of knowledge are capable of being used in varying situations, or can be treated as additive from lower to higher levels of application, i.e., that knowledge is scalable. The concepts of transferability and scalability of knowledge underlie the HSMS Knowledge Classification System.

The HSMS Knowledge Classification System's categories are limited to the following types of knowledge:

1. Subject categories which represent organized bodies of knowledge which can be conceived of as ranging in content from simple to advanced levels and which can be required at varying levels in a variety of tasks.

2. Subject categories which are not merely the names of the individual steps of tasks.

3. Subject categories which, even at lowest levels of use, require a learning effort beyond every day experience and beyond the usual process of maturation. The learning effort involved may be formal or informal, but it must involve a conscious effort to be acquired so that it can be applied in different situations.

4. Subject categories which can be identified as being required in competent task performance.

Excluded are the procedures or arrangements characteristic of a particular institution (orientation knowledge). Such knowledge is learned in terms of "first you do this, and then you do that" and is not transferable. Also excluded is knowledge which cannot be scaled from low to high levels, and curriculum contents not applicable to work situations.

The subject categories which make up the Knowledge Classification System are presented in an outline form, in a system of progressive

indentation. Each category has a unique, 8-digit identification code. The broadest level of the outline has a non-zero digit in the far left position. The progressive indentations continue the prior levels' digits, and have a non-zero digit in the position corresponding to the category's respective level of indentation. The categories are no more finely broken down than it was expected would be needed to identify in the field and scale. Figure 3 is a page from the Knowledge Classification System and indicates the way the system is laid out.

Only those categories which have a number sign (#) or are underlined (or both) are used for identification purposes. (The reason is related to the statistical need to turn categories into variables for clustering tasks.) The categories with number signs are called fine level categories; those that are underlined are broad level categories. In some cases categories have not been further subdivided even though they are broad; some broad categories are fine with respect to still broader categories. Such categories have both number signs and underlining. (Categories which will clearly warrant elaboration of subdivisions in future work are indicated with asterisks.) Figure 3 has examples of each.

When a job analyst identifies a category for a task he must consider its related broad-level category if the one chosen is fine; and must consider all its fine-level subdivisions if the one chosen is broad. This rule does not mean that the analyst must identify the broad (or the fine), but that he must consider whether the category is (are) required for the task.

Figure 3. SAMPLE PAGE FROM THE KNOWLEDGE CLASSIFICATION SYSTEM

```
         1  2  3  4  5  6  7  8

10000000 NATURAL SCIENCES

11000000     BIOLOGICAL SCIENCES

11100000       # History of the biological sciences*

11200000       # Genetics (For molecular and microbial genetics see
                 Molecular biology.)*

11300000       # Evolution*

11400000       # Biogeography*

11500000       # Ecology (Includes ecosystems and conservation.) (For
                 the physical aspects of air pollution see GEOSCIENCES,
                 CHEMISTRY, PHYSICS, and ENGINEERING AND TECHNOLOGY;
                 for the health aspects of pollution see Community
                 health and preventive medicine and Epidemiology.)

11600000       # Botany*

11700000         Zoology

11710000           # Invertebrate zoology*

11720000           # Vertebrate zoology (through mammalia, but excluding
                     humans)*

11730000             Human zoology

11731000                 Normal structure and function (The categories
                           listed below include both anatomy and phy-
                           siology except where otherwise specified.)

11731100                   # Regional anatomy (Includes head and neck,
                             thorax (back) and abdomen, pelvis and
                             perineum, lower and upper limbs, and
                             skeleton.)

11731200                   # Topographic anatomy (relation of external
                             manifestations to internal structure
                             and function, e.g. location of pressure
                             points, surface appearance of joints,
                             muscles and bones.)

11731300                   # Hematopoietic system (Includes blood,
                             red and white blood cells, platelets,and
                             and bone marrow, liver and spleen in
                             their blood forming function.)
```

The Knowledge Scale

One of the criteria for inclusion of a category as "knowledge" in the Knowledge Classification System is that tasks must conceivably require the category at varying levels. Thus, a category must be "scalable." The HSMS method uses a single scale for measuring the levels of all categories. Figure 4 presents the Levels of Knowledge scale. As with the skill scales, the Knowledge Scale has a name, an overall statement of its content, and an indication of what scaling principles are to be used to differentiate each of its various numerical levels. Each numerical scale value (which can range from 0.0 to 9.0) is accompanied by a descriptive statement (descriptor) which describes the behavior warranting that descriptor's scale value. The descriptors use generic language, and can be used for any knowledge category.

The Knowledge Scale has two scaling principles and a minimum condition which must be met before a category can be identified at a non-zero level on the scale. The minimum condition is that the knowledge must take some expenditure of time and effort to acquire, so the knowledge is usable in another context; i.e., that it is transferable.

The two scaling principles deal with (1) breadth of knowledge and (2) depth of knowledge. The first scaling principle (breadth), reflects the minimum condition for a non-zero value on the scale. Breadth of knowledge, refers to the amount of detailed knowledge the performer must know about the subject. This covers the variety of topics, facts, procedures, or other aspects of information covered by the subject.

Figure 4. THE LEVELS OF KNOWLEDGE SCALE

This scale refers to the level of knowledge in a given subject category required of the performer in the task being scaled. The knowledge categories which are required for each task are identified, and each category is rated with this scale. To be rated above zero on the scale the task must require knowledge beyond the simple memorization of the overt steps of the task. The scale rises with the amount of detailed knowledge which must be consciously applied and with the depth of understanding required in the subject area, in terms of its content, the structure of its ideas,and its uses. "Detailed knowledge" covers such things as technical or special terms or facts. "Consciously applied" means that the performer is able to (but need not) articulate his use of the knowledge in the task situation.

The level of a knowledge category should not be determined by the task's level on other knowledge categories,or that required in other tasks in the job using the same knowledge category, nor by the level of General Intellectual skills which may be involved.

SCALE VALUE	DESCRIPTIVE STATEMENT
0.0	The task does not require the performer to consciously apply knowledge in this subject category which has been gained in a learning experience requiring more than the memorization of the overt steps of the specific task being scaled.
--	
--	
1.5	The task requires that the performer consciously apply a limited amount of detailed knowledge in this subject category, including such things as technical or special terms or facts.
--	
2.5	The task requires that the performer have a general awareness of this subject category in terms of its content, the structure of its ideas, and its uses. The performer must consciously apply a limited amount of detailed knowledge in this subject area, including such things as technical or special terms or facts.
--	
3.5	The task requires that the performer have a general awareness of this subject category in terms of its content, the structure of its ideas, and its uses. The performer must consciously apply a moderate amount of detailed knowledge in this subject area, including such things as technical or special terms or facts.
--	
--	
--	

(continued on next page)

Figure 4. THE LEVELS OF KNOWLEDGE SCALE (continued)

SCALE VALUE	DESCRIPTIVE STATEMENT
5.5	The task requires that the performer have a considerable degree of understanding of this subject category in terms of its content, the structure of its ideas, and its uses. The performer must consciously apply a moderate amount of detailed knowledge in this area, including such things as technical or special terms or facts.
--	
--	
7.0	The task requires that the performer have a considerable degree of understanding of this subject category in terms of its content, the structure of its ideas, and its uses. The performer must consciously apply a very great amount of detailed knowledge in this subject area, including such things as technical or special terms or facts.
--	
8.0	The task requires that the performer have a very deep understanding of this subject category in terms of its content, the structure of its ideas, and its uses. The performer must consciously apply a moderate amount of detailed knowledge in this subject area, including such things as technical or special terms or facts.
--	
9.0	The task requires that the performer have a very deep understanding of this subject category in terms of its content, the structure of its ideas, and its uses. The performer must consciously apply a very great amount of detailed knowledge in this subject area, including such things as technical or special terms or facts.

The second scaling principle deals with depth of understanding and rises from "general awareness" to "considerable degree of understanding," to "a very deep understanding." The nature of the category determines the way depth of understanding is manifested, but depth of understanding always refers to the comprehension of the "hows," "whys," and "whats" of the subject.

DATA COLLECTION AND ANALYSIS

Task analysis using the HSMS method proceeds in a series of stages. It is carried out by a team of two or more job analysts who are trained in the methodology. The method is designed to be learnable by persons who are not themselves health practitioners so that it can be part of the central manpower function of an institution. Prior to their field work, the analysts inform themselves of the general content of the jobs they will cover.

The methodology includes laying a groundwork during the scheduling period. During this time the analysts ensure that information about the task analysis work is disseminated to all the managerial levels that must be involved in arranging interview time with the performers. The performers themselves are met and informed about the task analysis. Where unions are involved, their cooperation is obtained.

The data collection begins with task identification, which is done primarily through interviews with the performer, but which allows for some observation of tasks that are hard to describe.

The sequences in task identification are as follows:

1. A team of at least two job analysts is required for task identification. The team must agree on the identifications, based on interviews (and observation). These identifications are entered on Task Identification Summary Sheets.

2. The preliminary identifications are submitted to the Director of the Project, who edits them for language usage and clarity, but who also reviews the identifications for conformity to the definition, and for completeness of information. A conference is held with the analysts involved, and, if any ambiguities remain, the analysts go back to the performer for further information.

3. The revised tasks are submitted to an expert at the institution, "the resource person," who reviews the tasks for accuracy in use of technical language, accuracy in procedural descriptions, and possibilities of task omissions. If the analysts cannot accept the changes or answer the questions, they go back to the performer for further information.

4. The revised tasks are presented to the performer for his approval. The analysts delete anything not done by the performer (or by someone in the title), make changes, and otherwise bring the tasks into closer conformity with what is actually being done by the performer or incumbents in the title.

After task identification, the revised tasks are the data base for which skill and knowledge data are collected. Skill scaling data and knowledge identification and knowledge scaling data are also collected in a series of interviews with the performer. In each case the team of analysts must agree about its final judgments. The data are later reviewed for consistency.

Ideally, the skill and knowledge data are also reviewed by a "resource person." (In the case of the pilot test this was done by the Director of the Project and two general consultants.) The resource

person would be someone or several persons in a position to evaluate the appropriateness of the knowledge categories identified as well as review the scale levels chosen for tasks and knowledge categories.

Preparation of Data

The HSMS method for clustering tasks into related skill and knowledge hierarchies uses a computer-based, advanced form of factor analysis. In these programs the unit of observation is the task. The variables are the skills and the knowledge categories. Each task has a scale value on each skill scale, and a value on the knowledge scale for every knowledge category identified for any of the tasks being studied.

The data collected in the field are coded with identification information for each task and with the skill and knowledge data for each. There are an undefined number of data cards for each task. The first card tells the computer how many cards will follow for the given task. The next card is in a fixed format, and presents the scale values for each of the 16 skill scales for the task. Any other cards are numbered consecutively and are set up so that the ID number of the knowledge categories identified for the particular task are entered along with the scale values for each.

The HSMS Edit program receives the data cards in any task order, but always with the cards for a given task (observation) in numerical order by card number, beginning with the first card. The Edit program then performs the following functions:

1. A check is made to be sure that all scale values are in the correct range; i.e., gross keypunch errors are flagged.

2. A check is made to be sure that no task appears more than once; i.e., that only one set of data per task ID number will be "read in" to the computer.

3. The program "reads in" the tasks' scale values for the skill variables from the fixed format, and assigns ID numbers from 1 to 16 to the skill variables.

4. The program "reads in" the tasks' knowledge category values. This is done in a process which acknowledges and assigns a location to each different 8-digit knowledge category identification code, and assigns a variable number to each different one, starting from 17. For each category identified but not found for a given task, a scale value of zero is assigned by the computer.

5. The program produces a printed output which indicates what the variables are, from 1 to 16 as skills, and from 17 to n, depending on the number of knowledge categories involved. It allows the user to delete knowledge categories that do not appear on a sufficient number of tasks or to delete specific categories. It also shows the task locations and scale values for each knowledge category identified.

6. The program provides the user with the option of utilizing another program which "normalizes" the data. This is a non-linear transformation performed on the data to bring them into a closer approximation to a "normal distribution." No major distortion of the data is involved, but the statistical problems encountered with a proliferation of zeros (when a large number of knowledge categories scale at zero for many tasks), can be avoided.

7. The program places the final data onto tape files, where they are then inputs for the actual steps of factor analysis.

Factor Analysis of Variables (Skills and Knowledge)

Factor analysis deals with observations and variables. It examines the statistical relationship of every variable with every other variable, and groups these in such a way as to best account for all the variability represented by the ratings of all the observations (tasks) on

all the variables. A factor solution essentially groups related variables into arrangements which explain the data with fewer concepts than the sum of the original variables. A given factor essentially replaces a group of interrelated variables with a single construct which expresses the interrelationship within the group. Factor analysis usually results in the creation of two or more factors from a much larger number of variables.

The first stage of the factor analysis creates the "variable factors." These are determined by those skills and knowledges which tend to be interrelated and therefore can be expected to rise and fall together. This means that, for the purpose of curricula, variables which factor together should tend to be taught together, since they are usually needed at interrelated levels on their respective scales.

Since every variable is rated on every factor, what determines a variable factor are those variables which "load high" on the factor. Variables can load on factors within the range of $\pm .99$. Variables which are positively interrelated on a factor will have the same sign. The + or - has no other intrinsic meaning.

An acceptable factor solution has an optimum number of factors for the purposes involved and preferably much fewer than the original number of variables. One criterion used is that the number of factors chosen must result in most variables having high loadings on only one factor, with each factor having several variables which load high on it. Another criterion used is that the factors chosen show stability in their high-loading variables across several factor solutions. The most important criterion, however, is that the factors must make sense.

Factor Analysis of Tasks

The procedure used for clustering the tasks is a modified version of the Tucker-Messick procedure for factoring an individual differences matrix [65]. The procedure was developed at the University of Illinois by E. E. Davis, H. C. Triandis, and L. Tucker. The HSMS version is a new application and modification of the original technique [16]. The program's essential feature is that it permits the extraction of principal axis factors for both observations and variables (two modes), based on a co-variance or a correlation matrix of variables. It is then possible to rotate the variable mode to "simple structure" by a Varimax routine, and "counter-rotate" the observation mode (tasks).[1] This method has been dubbed "two-mode" factor analysis, while the simple factoring of variables is called "simple" factor analysis.

The decision regarding the number of factors in the simple factoring of the variables determines the number of factors for the tasks. In fact, it is the interrelationships among the variables on a simple factor that determines a task's loadings on a given task factor.

The "two-mode" program results in a print-out of the desired variable factors and the counter-rotated task factor solution. The output lists the tasks by code number and provides each task's loadings on each factor.

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[1] Counter rotation is done by obtaining the transformed characteristic vectors of the observation mode induced by the Varimax rotations of the variable mode.

The loadings of the tasks on factors are interpreted as follows. The sign of the variables (plus or minus) which makes up a given factor's chief character on the variable factor solution determines the sign to consider for the loading of tasks on the corresponding task factor. A task's loading on the factor is due to the combination of the variables present for the task, their loading on the corresponding variable factor, the scale values in the task for the variables,and the number of such variables required for the task. If a factor's characteristic sign is positive, tasks can load at any relatively high level such as 3.00 or 5.00, or can load at levels as low as .01 or .02. Tasks can also load at -.01 or -5.00, which are much lower relative loadings.

The rank order of tasks on factors is obtained by arranging tasks by their loadings from high to low within the characteristic sign, through zero, and from low to high in the opposite sign. These loadings are not normalized and serve only as relative measures. This arrangement of tasks into hierarchies makes it possible to determine on which factor a task loads highest, as well as the relative order of tasks on a factor.

Assignment of Tasks to Factors

Rank ordering the tasks for each factor is not enough for assignment of tasks to factors. A task may load high on many factors. The nature of the variable data in health care tasks is such that many higher level tasks require many knowledge categories and most skills, and some variables are represented in more than one factor. Thus, it must be emphasized that the assignment of a task to a factor must primarily reflect

its relation to lower-level tasks in the factor in terms of the overall meaning of the factor and its determining variables.

The method used is to assign a task to the factor on which it loaded highest, with assignment to other factor(s) on which it loads high if the manifest content of the task and the factor warrant this. At the initial stage of analysis this practice permits detailed inspection of alternatives. Tasks which load low on all factors because they require little or no knowledge or skills are not assigned to factors unless there is a clear association of the context of the task with the content of the factor. For example, preparing for suture would be put into the same factor with actual suturing by virtue of context.

Since the concept of graduated educational steps lies behind the reason for arranging tasks into hierarchies by factor, tasks in each rank ordering are inspected to see if some tasks should not be on one or another factor by virtue of requiring too many skills or knowledge categories unrelated to those required by the other tasks in the factor. The reader will remember that the task's loading on a factor determines its rank order on the factor; but the task can require a good many other skills and knowledge categories beyond those determining the factor. As a result of this latter inspection, the number of tasks assigned to more than one factor can be somewhat reduced.

Assignment of Tasks to Levels by Factor

Although the factor loadings for the tasks permit easy assignment of tasks to factors, the meaning of a difference of loading of, for

example, .83 and .44 is hard to judge in educational terms. A task loading at .83,when contrasted with a task loading of .44 means more categories related to the factor for one task, or higher scale values for the categories, or a combination of these. In addition, the loading of its variables on the variable factor which corresponds to the task factor also influences a task's factor loading on a task factor.

Since the objective is to identify rungs on a ladder, stages in a sequence, or comparable levels for tasks -- all of these being interchangeable concepts -- it is necessary to do one further type of analysis. The tasks of a factor are laid out in rank order of their loadings on the factor, from low to high, and the skills and knowledges are laid out in the order of their appearance in the tasks. This permits identification of the major cut-off points between tasks which mark major increases in scale levels or the addition of large blocks of new knowledge categories. This information is used to determine which tasks within a factor are at the same relative level. Finally, by using the tasks which appear in more than one factor as an added guide, it is possible to relate the task level groupings across factors in broad educational terms.

Ladders and Lattices

Job ladders or task sequences refer to vertically promotional steps derived from the grouping of tasks which draw on rising levels of interrelated skills and knowledge. This assumes both the transferability and the additive nature of the skills and knowledge. The HSMS task data make it possible to pinpoint the skills and knowledge needed for every

task factor and for each level within a factor. It is thus possible to delineate the necessary curriculum content for each level in a task sequence and also to identify the educational gaps between levels. The difference between the highest achieved scale value for each skill and knowledge category at a particular sequence level and the highest necessary scale value for skills and knowledge at the next sequence level, plus any new skills and knowledge needed at the next level,defines the educational gap between two levels.

Job lattices or task sequence lattices allow for linkages across ladders both horizontally and diagonally. Where there is transferability of skills and knowledge at a given level there can be crossover options and a choice of promotional pathways. The principle involved is that the skills and knowledge used in a given task sequence level may serve as a basis for more than one specialty. A given specialty may build on more than one kind of prior preparation, and the entry to specific professional jobs can thus be reached in a lattice by more than one sequence. Conversely, a given sequence level can be a step towards more than one specialty.

The type of analysis of task data to define the gap between levels on a given task factor can serve to identify the educational gap across sequences on different task factors. In the HSMS data, tasks which load high on more than one factor provide the clue for the most logical lattice possibilities.

TASK DATA AND CURRICULUM DESIGN

While the HSMS method was designed to identify curriculum content beyond the statement of task procedures, it is equally important to differentiate the skill and knowledge data from actual curriculum design.

The skill and knowledge variables on which the tasks are rated are designed to reflect only attributes which can be treated as additive and which occur at varying levels. The skill and knowledge variables reflect only attributes which are obviously required for task performance. As a consequence, it would be impossible to assume that the task data can cover or provide for coverage of all the curriculum content required to train an individual for a given occupation. Non-transferable, non-additive,and prerequisite contents are not covered by the skill and knowledge categories, and cannot be assumed to be covered in the List of Task Elements found on the Task Identification Summary Sheets.

In addition, the language of the knowledge scale, which refers to the depth and breadth of knowledge in the category, is broadly written. This does not substitute for the specific pinpointing of educational objectives and informational objectives in the design of curriculum.

The task statements and the skill and knowledge data can be used as inputs to curriculum design, as a type of checklist for curriculum content. While these data cannot, in and of themselves, be curricula, the task identification data and the skill and knowledge profiles can, however, act as reminders of what must be accounted for.

Very important is the fact that the specific knowledge categories appear at scaled levels in the tasks and task sequence levels. It can be made clear to the educator at what stage a particular subject area must be taught and at what level. In addition, by examining the other tasks and sequence levels in a ladder or lattice, the educator can see what depth and breadth of comprehension will be required of the performer and the curriculum sequences can be planned accordingly.

The educator can use the task data laid out in ladders or lattices to decide when to introduce specific information and subjects, how to introduce them,and how to tie the training to work. More important, in being able to show how the same knowledge or skill is used for more than one task, the educational effort itself can be enhanced, and the ability of the student to generalize and apply his training will be improved.

Job ladders building on the skills as well as on knowledge provide exit points along the way for practice, so that in the next learning sequence, as the individual rises, the prior learning is reinforced and added to. This presupposes that the educational methods will emphasize and amplify the additive nature of the learning and will not provide the training in discrete, disconnected units.

This brings into focus the relevance of teaching the skills directly and in connection with the knowledges to be applied. The intellectual skills, as any others, require practice. The teaching of these skills requires methods of education allowing for the practice of the skills in the process of acquiring knowledge.

The curricula can be specifically geared to draw on the interrelationships of skills and knowledge, and can utilize the different knowledge areas to specifically develop the skills. The skills can be used to develop the understanding of the knowledge. If the teaching methods emphasize the direct teaching of skills as well as knowledge, both needlessly long and unduly inadequate training could be eliminated to an extent not yet imagined.

The Curriculum Unit

The use of curriculum units is needed in the design of curriculum ladders. The crucial strength in the cirriculum unit would be its ability to clearly articulate and relate learner activities, anticipated outcomes, job objectives and general educational objectives. In addition, the teaching method then becomes an integral and an absolutely necessary part of the curriculum design.

The HSMS preliminary definition of the curriculum unit is offered as a bridge between task data and curriculum design. The curriculum unit represents the subject matter to be imparted to the student in order for the student to be able to demonstrate his mastery of a cohesive, interrelated set of ideas and/or procedures. The curriculum unit is expressed in a behavioral statement (discussed in Chapter 2) similar to an Informational Objective,[2] and has the following characteristics:

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[2] An "Informational Objective," as used by educators, describes the behavior which a learner will have to employ to demonstrate his mastery of the informational and/or skill content of the objective.

1. The behavioral objective must have self-evident and independent meaning; it must be comprehensible without the statement of other behavioral objectives. (Otherwise it is too small.)

2. The behavioral objective must be able to be stated briefly, such as in a paragraph. (Otherwise it is too large.)

3. The behavioral objective should require the student to learn a somewhat complex, interrelated set of procedures and/or skills and/or ideas which can be demonstrated. (Otherwise it is too small.)

4. All the subject matter contained in the curriculum unit must be necessary for the demonstration of mastery of the behavioral objective, and all its contents must be logically related. (Otherwise it is not cohesive.)

5. It must be possible to convert the behavioral statement into a Planning Objective statement by the addition of a statement concerning the conditions of demonstration and the criteria for evaluation of the mastery of the content of the behavioral statement.[3] (Otherwise it is too large.)

6. It must be possible to relate the curriculum unit to a general Educational objective.[4] (Otherwise it may be irrelevant.)

7. It should not be possible to divide the behavioral statement into still finer Planning Objective statements which could also fulfill the criteria listed here for behavioral statements. (Otherwise it is too large.)

8. It should not usually require the content of an entire course to make it possible to achieve the behavioral objectives of the curriculum unit. (It usually would mean it is too large.)

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[3] A "Planning Objective," as used by educators, (1) describes the behavior which the learner will have to employ to demonstrate his mastery of the informational and/or skill content of the objective; (2) it describes the conditions under which the behavior is to occur; and (3) it describes the criteria which are to be used to evaluate the learner's mastery.

[4] A "general educational objective," as used by educators, states the nature of the broad subject area involved in an educational program and indicates the type of behavioral goal to be reached in relation to it.

Informational Objectives and curriculum units which are common requirements for a number of jobs could be offered to students preparing for various jobs in a ladder or several different jobs in a lattice. Once they were identified, they could provide the basis for efficient use of time and for enrichment of students' experience through exposure to co-workers in different but related activities.

The definition presented above and the eight standards for its application were developed by the Health Services Mobility Study as the first tentative effort at an operational definition of the curriculum unit. At this writing it has not yet been field tested for reliability, nor has a manual been designed for curriculum unit identification similar to the field manual for task identification.

CHAPTER 4

RESULTS AND APPLICATIONS

The pilot test of the job analysis methodology made it possible to learn that the HSMS system is workable and can produce usable results. It also produced specific results of relevance to the institution in which the test was done. Beyond this, the results were generalizable to other institutions and made possible some new insights about the structure of health care jobs and functions. In addition to the obvious applications for the particular jobs and the institution, there are a large number of other uses to which the HSMS task data can be put. This chapter summarizes the results of the pilot test, describes some of the insights gained, and lists a series of potential uses for the HSMS task data.

PILOT TEST RESULTS AND APPLICATIONS

The pilot test indicated that the HSMS task definition can be applied to tasks at the professional physician level as well as to tasks at the lowest level. The definition can be grasped and fairly reliably applied by job analysts in a consistent fashion. The definition accounts for the contingencies and emergencies which can periodically arise in tasks, and thus does not water down professional performance by over-fragmentation of task boundaries.

The sixteen skill scales have been proven to be reliable and usable in the field, can be applied to all tasks, regardless of content, and interrelate with knowledge categories in an interpretable way.

The Knowledge Classification System has been proven usable in the field for both upper-level and lower-level tasks and results in meaningful data. The Knowledge Scale also proved to be reliable and usable in the field.

The pilot test period indicated that job analysts could apply the scales with little difficulty, and that the language of the Knowledge System could be understood and applied provided that the job analysts were careful to prepare themselves beforehand and maintained a close check on whether they and the performers were, in fact, talking about the same subject area or task. Some revisions were made in field procedures, in the skill scales, and in the Knowledge System as the pilot test progressed.

The most exciting part of the pilot test was, in one respect, the actual computer work. For several years, while the method was being developed, it could not be fully known whether the factor analysis programs would yield statistically adequate and interpretable results. In addition, there was no way of predicting beforehand what would be learned about the ways in which skills and knowledge variables interrelate in the world of patient care.

The computer based statistical procedures proved to be entirely successful. The "two-mode" factor analysis resulted in groupings (factors) of skills and knowledges which were interpretable, made sense, and satisfied statistical criteria for "good" factor results. Moreover, the counter-rotation of these skill and knowledge factors resulted in factors of tasks

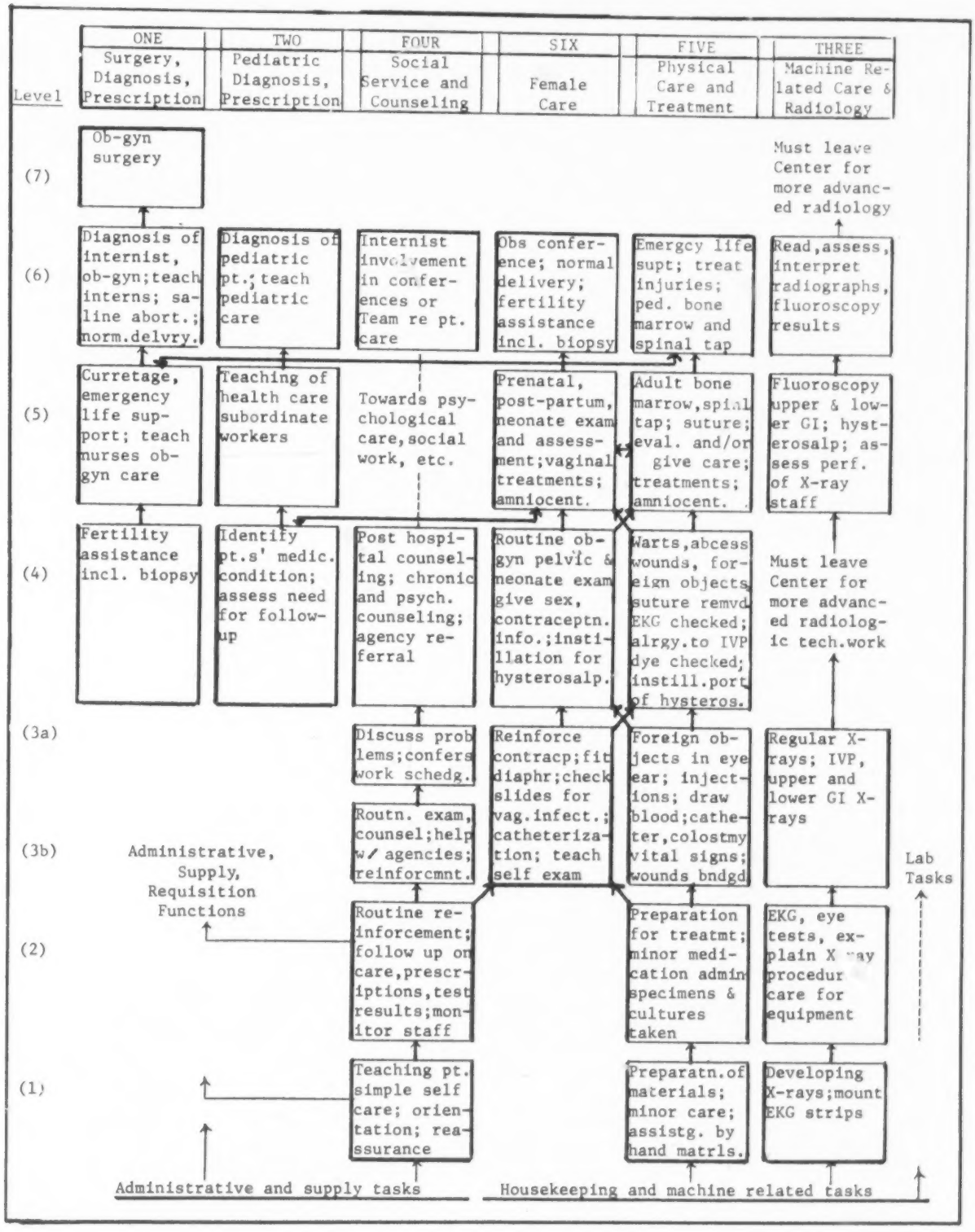
which could be arranged into task hierarchies that reflect the relationship of task requirements to the groupings of skills and knowledges. It was thus possible, with some further analysis, to arrange these hierarchies into sequences or levels, so that actual stages and ladders could be devised.

The simple factoring of variables was very satisfactory. There was no doubt that a six factor solution was the most appropriate. The six factors accounted for all but three of the variables. The "two-mode" program resulted in six task factors that made sense and strongly reflected the factor structure of the variables.

The task factors resulted in six sets of task sequences arranged over seven levels. Two of the task sequences begin at the professional level and can only be reached by a lattice-like movement from the other four. These two deal with surgery and with diagnosis and prescription of care within the fields of internal medicine, obstetrics-gynecology and pediatrics. The other factors cover female care, physical treatment, social service and counseling (behavioral functions), and machine related care and radiology. Figure 5 presents a graphic representation of the task sequences. The general task content of each level is indicated by abbreviated notations in the boxes.

The distinction between professional and lower-level tasks appeared to have two aspects. First, in health occupations, the sheer quantity of required knowledge categories increases at upper levels; second, there is a sharp rise in the level of comprehension required at

Figure 5. GRAPHIC SUMMARY OF TASK SEQUENCES AND LATTICES


Level
ONE
Surgery, Diagnosis, Prescription
TWO
Pediatric Diagnosis, Prescription
FOUR
Social Service and Counseling
SIX
Female Care
FIVE
Physical Care and Treatment
THREE
Machine Related Care & Radiology
(7)
Ob-gyn surgery
Must leave Center for more advanced radiology
(6)
Diagnosis of internist, ob-gyn; teach interns; saline abort.; norm.delvry.
Diagnosis of pediatric pt.; teach pediatric care
Internist involvement in conferences or Team re pt. care
Obs conference; normal delivery; fertility assistance incl. biopsy
Emergcy life supt; treat injuries; ped. bone marrow and spinal tap
Read, assess, interpret radiographs, fluoroscopy results
(5)
Curretage, emergency life support; teach nurses obgyn care
Teaching of health care subordinate workers
Towards psychological care, social work, etc.
Prenatal, post-partum, neonate exam and assessment; vaginal treatments; amniocent.
Adult bone marrow, spinl tap; suture; eval. and/or give care; treatments; amniocent.
Fluoroscopy upper & lower GI; hysterosalp; assess perf. of X-ray staff
(4)
Fertility assistance incl. biopsy
Identify pt.s' medic. condition; assess need for follow-up
Post hospital counseling; chronic and psych. counseling; agency referral
Routine obgyn pelvic & neonate exam give sex, contraceptn. info.; instillation for hysterosalp.
Warts, abcess wounds, foreign objects, suture remvd EKG checked; alrgy.to IVP dye checked; instill.port of hysteros.
Must leave Center for more advanced radiologic tech.work
(3a)
Discuss problems; confers work schedg.
Reinforce contracp; fit diaphr; check slides for vag.infect.; catheterization; teach self exam
Foreign objects in eye ear; injections; draw blood; catheter, colostmy vital signs; wounds bndgd
Regular X-rays; IVP, upper and lower GI X-rays
(3b)
Routn. exam, counsel; help w/ agencies; reinforcmnt.
Administrative, Supply, Requisition Functions
Lab Tasks
(2)
Routine reinforcement; follow up on care, prescriptions, test results; monitor staff
Preparation for treatmt; minor medication admin specimens & cultures taken
EKG, eye tests, explain X ray procedur care for equipment
(1)
Teaching pt. simple self care; orientation; reassurance
Preparatn.of materials; minor care; assistg. by hand matrls.
Developing X-rays; mount EKG strips
Administrative and supply tasks
Housekeeping and machine related tasks

upper levels even where the knowledge categories have already been covered. The task sequences suggest, however, that jobs can be structured to provide for graduated increments in the number of subject areas and in the levels of the subject areas required.

The task sequences suggest that traditional distinctions in specialties may not be as relevant for ladders as functional specialties. Where skills are involved, the sequence of tasks ensuring continued clinical practice may be more important than the assignment of tasks according to traditional medical specialties.

The analysis indicated that lattice as well as ladder movements could be evaluated, and that the relative educational efforts to make such movements could be compared. This means that specialized, flexible educational programs can be designed using the task data for the initial analysis. (Lattice possibilities are shown on Figure 5 by arrows.)

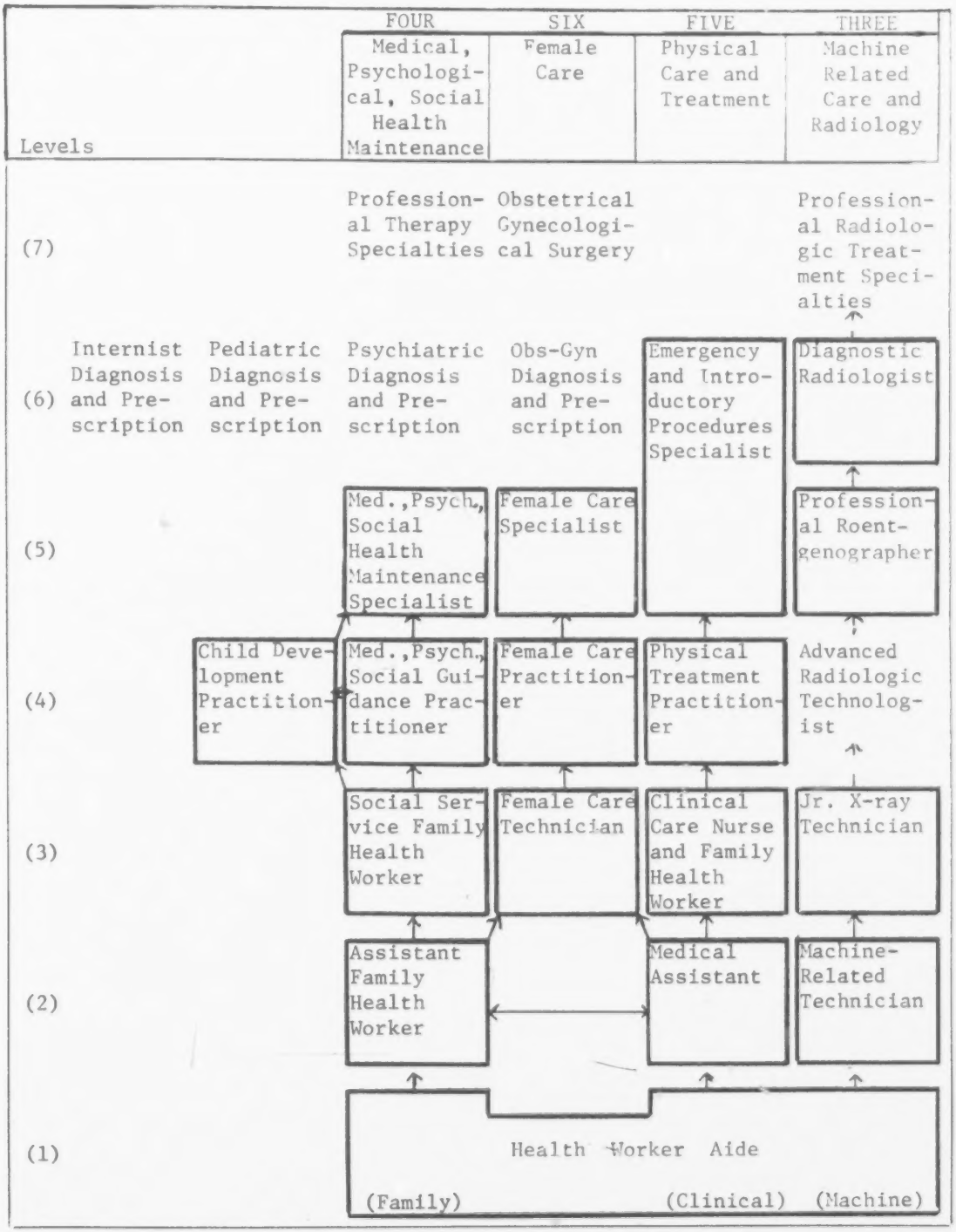
The pilot test data suggest that the task sequences are somewhat truncated when applied to a narrow group of twelve titles; the results should be richer, more generalizable and more viable when the data base is widened to other types of institutions and to other titles. However, there was enough data to actually design job ladders.

Four "idealized" ladders were designed which build on existing functions but also reflect HSMS recommendations for changes in job structure, formal curricula and licensure. These cover Medical, Psychological and Social Health Maintenance; Physical Care and Treatment; Female Care; and Machine Related Care and Radiology.

The jobs should be applicable in any ambulatory care setting, and especially in any health maintenance organization serving a community. Figure 6 presents graphically the essentials of the four basic ladders being proposed. Each box presents the name of a job function. Lattice relationships are indicated by arrows. The remaining two factors of the original six are represented only by the physicians' functions in appropriate relationships to the other ladders. This acknowledges that there is still a major educational gap between the jobs in the ladders and the essential diagnostic, prescription and post-professional surgery or treatment provided by the physician. (The details of the jobs in the ladders are described in Chapter 6 of Research Reports Nos. 4 and 5.)

In addition to the idealized ladder recommendations, two sets of more immediately usable suggestions resulted from the work. First, there was preliminary evidence to warrant the restructuring of several of the jobs studied on purely practical lines to provide for better allocations of tasks to jobs. Second, through application of some of the curriculum analysis work described in Working Paper No. 10, there was preliminary evidence to suggest that advanced standing in credentialed academic programs could be obtained for current incumbents in non-credentialed or lower-level titles at the Center (even without alteration of current job structures). Notably, these were for the Family Health Worker and Medical Assistant in an LPN program and for the LPN in an Associate Degree nursing program.

Figure 6. GRAPHIC SUMMARY OF IDEALIZED JOB LADDERS FOR CENTER



Job Structuring and Restructuring

Theoretically, tasks which are adequately performed in lower-level job titles, or can be adequately performed at lower levels, are misallocated when they are also done by persons in upper-level titles. If an institution wishes to make better use of scarce and expensive upper-level manpower resources, such data are of relevance. The HSMS task definition made it possible to identify true task overlap and to avoid confusing overlap of elements with overlap of whole tasks. Misallocation of tasks can be expensive. The advantage of having overlap data is that, given acceptable performance of the tasks in currently overlaped titles, there is a prima facie argument for downward assignment of overlap tasks to the lower salary levels. Research Reports Nos. 4 and 5 made recommendations based on an analysis of task overlap at the Center.

Task data giving the factor and level assignment of each of a title's tasks provided insights into the appropriateness of staff utilization patterns. The assignment of tasks to factors provided some interesting insights. There was no uniformity with respect to the spread of tasks across factors, but it appeared that some performers were operating in more areas than is appropriate for optimum use of training time or resources.

The distribution of tasks by level was of immediate consequence with respect to utilization. The pilot test data made it possible to discover that some upper level, more expensive manpower were carrying out tasks well below their capabilities. On the other hand, it was found that

some titles were assigned tasks whose requirements were above the level to be expected from the titles to which they were assigned. This suggested the possibility of inadequate performance or an undue training effort, considering all the other tasks assigned to the titles.

Relationship to Goals

Analysis of the HSMS pilot study tasks and the resulting task sequences provided an unexpected insight. It was that, though the goals of the Center are clear, the structure of its jobs did not seem to fully mirror the goals. Though the role of the Team was apparent, its most essential aspects seemed to be somehow truncated and out of focus. It became possible to articulate such insights once the data were analyzed, since the relationship between stated goals and achievement had to pass an empirical test. That is, it was evident that all the goals were not found to be expressed in specific tasks through their outputs, or in required skills and knowledge. There could be no assumption that the goals were being fulfilled, and functional changes were suggested.

Benefits of Ladders

While the most obvious function of job ladders is to relieve shortages in upper level staff and shortages in educational resources, task analysis made it possible to conceive of several other equally valid reasons to prefer the upgrading of current employees over the exclusive employment of new people at each level.

It is now apparent how important some of the HSMS skills are to some of the task functions, particularly in the area of physical treatment and care, where Consequences of Error for Humans and Object Manipulation are very much involved. This suggests that the gradual rise in level of skill, responsibility, and knowledge which is reinforced and tested in actual work practice may result in better, more successful performance at the upper levels than is now the case with students arriving with purely educational experiences and without the mutually reinforcing benefits of education and practice learned in work. The fact that clinical training is part of approved programs in health care suggests the truth of this. However, the experience of the job itself, in connection with release-time training for the next higher level, may be a beneficial source of clinical practice. Especially in the area of physical treatments such as the use of introductory procedures, the long period without practice, inevitable when the student embarks on the long route from high school graduation to internship, seems less than appropriate in comparison with the alternative.

In addition to the benefits from practice in actual physical performances, job ladders provide benefits to the patient in the form of consistent approach and continuity of attention. The patient is frustrated by bureaucratic divisions and fragmented services. Much of this comes from the extent to which professionals and sub-professionals work at cross purposes, with different goals, and from the extent to which the elements essential to the service are lost in the cracks between job titles.

The benefits of career ladders can be seen to include the fact that employees share and continually maintain an orientation to the goals of the institution as they rise. There is no danger that, at the top, they will consider themselves separate or independent of the institution's goals or unrelated to them. Having known the details of functioning at one level, the performer is better able to relate to those details at the next level. This includes knowing what goes wrong at that level -- in a way outsiders can never know -- and compensating for this.

The marked mobility and, therefore, transience of professionals can be compensated for by the continuity of individuals who will rise in relation to services and who will maintain links with the family or patient. The goal of continuity of attention is thereby promoted as a by-product of career ladders.

Another benefit of the ladders is that, unlike the creation of junior diagnostic tasks which are too difuse and shallow in their curriculum content to warrant advanced standing in professional schools (such as medical schools), the specialties in the ladders can provide enough educational depth in a concentrated area to warrant crediting the educational investment with advanced standing. As the ladders are now proposed there would be a major block of curricula by Levels 4 or 5 which could be designed to provide credits for advanced standing in medical school or another relevant professional school.

Finally, the nature of the ladders is such that current female employees could rise to levels in some specialties not fully open to them,

while, in the future, the ladders themselves might help to eliminate the sex images now attached to jobs.

FURTHER APPLICATIONS OF THE METHOD

Although the HSMS method is relatively time consuming, it results in task data which have a variety of useful applications. Some of these are described in this section. Other applications, particularly to industries and occupations beyond those of the health services industry are also to be expected.

Institutional Performance Evaluation

HSMS task data can be used for the purpose of establishing objective, work-related standards for the evaluation of institutional or employee performance. If quality is related to how work is done and to whether work is done, then an array of tasks describing the work being done is the proper starting point from which an institution can evaluate its functioning.

An institution may be concerned with assessing the quality of its procedures and outputs in a particular functional area. For example, a Health Center may wish to focus on the performance of its Family Health Team; a hospital may wish to examine its performance in the area of laboratory work; another hospital may wish to examine its life support and intensive care activities. An institution may also be concerned with assessing the quality of performance in one or more particular job titles. This approach can be useful in justifying advanced standing for incumbents in

one title who may perform tasks which overlap with those in a higher-level title. The justification would lie in being able to show that lower-level performance met normative standards for the higher-level title. An institution could also be concerned with assessing the quality of performance of trainees emerging from training for the purpose of evaluating the training program and pinpointing its weaknesses. Research Report No. 6 presents models for such evaluation which use the task data for normative and diagnostic purposes. (See Chapter 5.)

Trainee Selection

Any manpower policy for implementing job ladder principles for upward mobility and/or expecting to provide upgrading training must inevitably have a method of trainee selection. In any institution or industry with a history of dead-end or impacted jobs, the supply of employees interested in upward mobility will far exceed the demand for trainees at any given time. The reason is that there are limits on the investment that can be made in training resources and in the loss of productive hours within any given institution. Even massive shortages at middle or upper levels could be filled by job ladder programs only in periodic cycles of limited enrollment size.

Given the need to minimize the costs and time involved in training, there is some incentive for the institution to train those individuals who are most likely to succeed in the "target job" (the job for which the trainees are to be prepared). If, in addition, the existence

of an upward mobility program could improve the quality of performance of individuals in current jobs by providing an incentive, the net cost of upgrading programs could be substantially reduced.

The Health Services Mobility Study provides a methodology which can achieve these objectives. Research Report No. 6 presents a design for implementing a trainee selection program based on the HSMS job analysis data. The relationships among tasks which are related in terms of skills and knowledge become the bases for trainee selection by job title. These relationships can be used to predict success in upgrading programs by selecting appropriate trainee sources and by selecting appropriate trainees based on current performance.

Curriculum Analysis

The HSMS task data provide important inputs for curriculum analysis and design. Persons directing programs for various occupations can be given lists of task descriptions and can be asked to identify which of these tasks their programs teach directly or prepare the student to perform. The educators can then be asked to indicate what proportion of their programs are accounted for by the overlap training represented in the tasks they identify which are found in lower-level jobs.

The task statements and the skill and knowledge data can be used as inputs to curriculum design, as a type of checklist for curriculum content. These data cannot, in and of themselves, be curricula, since much of the needed knowledge is not represented, and the degree of

detail and the focus may not be appropriate for teaching purposes. However, the task identification data and the skill and knowledge profiles can act as reminders of what must be accounted for.

Working Paper No. 10 presents several preliminary models which utilize task data for the analysis of curriculum overlap and for curriculum justification; it also offers an approach to the design of curriculum ladders to parallel the newly designed job ladders.

Job Descriptions

There has been a continuous search for accurate job descriptions to be used as general statements of what employees can expect to do in their jobs and/or to help establish what they can be called on to do in their jobs. Accurate job descriptions can be developed from the HSMS data. (The skill and knowledge data are potentially useful for wage and salary administration as well, but would require adaptation for use in reimbursement plans.)

In situations where various institutions draw on a common labor force, such as where there is a municipal hospital system, voluntary hospitals,and proprietary hospitals, uniform job descriptions across institutions can be useful in the following ways:

1. Where collective bargaining is conducted with the same union in several institutions, uniform job descriptions facilitate negotiations for individual job titles.

2. Where educational institutions provide the training for occupations, it is easier to design uniform and adequate curricula by job title when uniform task designations are agreed on for the content of the job title.

3. When job applicants have prior experience in health care activities their qualifications can be more easily assessed when the same title means the same thing in the prior employer's institution.

4. When titles provide adequate indicators of employee skills and knowledge, employees have greater mobility across institutions.

The HSMS data provide the information needed to identify which tasks are representative of a title. Such tasks would appear in the job of each performer in a title, or could be shown to have high frequency of performance in a title. These can be referred to as characteristic tasks and become inputs in the creation of uniform job descriptions.

The use of uniform job descriptions should not be interpreted to mean uniform work assignments. Every institution has its own set of needs with regard to what it produces and how it organizes its work. No institution need have its job titles cover or include exactly the same tasks as in other institutions. Rather, uniform job descriptions provide common frames of reference for the content of jobs with uniform titles. Two alternative ways of doing this are:

1. The job descriptions can refer only to the characteristic tasks which appear in all the institutions; general statements describing the range of less frequently occurring tasks can provide for institutional variations.

2. The job descriptions can be based on agreements that all the tasks as they appear in any institution will be listed in descriptions, just as items on a menu are listed. Each institution would be assured that it is free to make its own selections from among these. This would be more difficult to maintain than (1), above, since the list would have to be updated as the need for new tasks arose.

Licensure

The evidence of task overlap and the process of creating job descriptions opens a major question of policy with regard to licensure. Theoretically, licenses are required in situations in which the public's well being must be protected by safeguards assuring safe practice. However, licenses function as though they were issued to people to allow them to carry job titles. Clearly, then, evidence of a great deal of overlap among titles raises some important questions. Perhaps, with the accumulation of sufficient task data, evidence in support of one point of view or another can be collected. The questions raised include:

1. If the tasks of a title change as technology changes, and if what once was a danger to the patient is now done without danger, what is the need for licensure?

2. If new tasks arise which require safeguards, must new titles be created to ensure safe practice through licensure? Must old licensure requirements be changed?

3. Is it more sensible to license the performance of tasks; that is, specific, dangerous activities using specific methods, and allow the institutions to determine the title in which to place the task? (The institution would then be required to ensure that anyone doing the task is properly trained or is licensed for the task.)

The data can provide arguments against unjustified licensure barriers which inhibit the upward mobility of health care workers.[1] Elimination of such requirements would not result in the watering down of appropriate skill and knowledge requirements; it would merely serve to pinpoint unnecessary and redundant requirements.

[1] One such case was uncovered in the pilot test, when it was found that a licensed title at the Center did not include any tasks warranting the two years of special training currently required by state law.

Counseling and Training

The HSMS task data can be used to orient and even to help train new employees. The extent of detail in the List of Elements, along with the skill and knowledge information, provide a kind of check-list for task performance.

In the field of counseling, both for current employees and for young people planning careers, any level of detail, from the Task Name to the List of Elements, provides a wealth of information useable to help individuals decide on job choices on the basis of interest in what the jobs can be expected to involve. The skill and knowledge data can be used to compare an individual's interests and educational experience with job requirements.

It has been found by at least one organization that the application of job analysis techniques serves as an excellent management training device to make middle-level administrative staff aware of the work of the institution and to develop a sensitivity to objective task requirements. The skill and knowledge data also help to pinpoint those aspects of managerial tasks which are too often overlooked in administrative promotion. If the "Peter Principle" is that people are promoted to their level of incompetence, then the HSMS principle is that this is true only when they are promoted in unrelated skill and knowledge ladders and without the training needed to take them to the next level, or without criteria for advancement connecting the two jobs.

Provision of New Services and Planning for Staffing Patterns

Task data can facilitate an institution's planning for the delivery of new services. If the institution has access to task data which cover those services at another institution, it has a concrete model to use in planning. For example, the Municipal Hospitals will be establishing ambulatory care centers. They might wish to have use of the task data collected at the Dr. Martin Luther King, Jr. Center to use in designing their own facilities. Similarly, as an organization extends services such as family planning by adding services such as child care, task data on child care activities already being provided elsewhere can greatly facilitate the transition to new staffing patterns.

Consumer Education

The detailed Task Identification Summary Sheets provide information on what a patient can expect to have done to or for him. Information about what to expect can help the patient to overcome fear or unrealistic expectations, and can also give the patient a basis on which to judge whether a particular activity is being appropriately carried out. Naturally, the task data should be subjected to normative evaluation and review before they are used for the purpose of educating the consumer.

Industry Mobility and Technological Change

Since the HSMS method is generic, it can be applied across industries and to new technologies as they are developed. New procedures and activities can be analysed with the same data collection methods as

existing procedures and activities. Thus, a new task or set of tasks can be assigned to the job title containing tasks most similar in the skills and knowledges required. The new tasks can be placed within existing task groupings. Workers' mobility across industries can similarly be facilitated by dealing with tasks across industries. Though it is not now imminent, the method could conceivably be used to facilitate employee readjustments due to the employment dislocations which could accompany disarmament.

Data Banks and Prototype Ladders

Since the HSMS methodology is generically oriented, it results in data which can be used beyond the walls of the institution in which the data are collected. The task data provide three levels of detail, and, therefore, can be abstracted as needed for the construction of prototypes. Alternatively, a set of data can be inspected by an institution and it can modify these to reflect its own conditions. Thus, as the method is used and a data bank becomes available, the applicability of the data grows geometrically; any number of combinations of data can be used to develop job ladders. The investment in time and effort to collect the data can be spread as time passes and only new task data are added.

Even simpler than modifying the task data would be the modification of reported job ladder designs to suit a given institution's needs. Thus, if an organization such as the Health Services Mobility Study can generate generalizable and basic job ladders, such prototypes have potentially limitless application.

CHAPTER 5

A GUIDE TO HSMS DOCUMENTS

This chapter reviews the full output of documents produced by the Health Services Mobility Study during Phases I, II, and III and notes their availabilities.

TECHNICAL REPORTS

Since the inception of the Project, ten Technical Reports have been produced. This report is itself the eleventh. The Technical Reports are progress reports which review the work of the Project over specific periods. They covered progress and events in research and technical support, future plans, and other organizational matters. The reports carried the statistical results of individual field tests and kept the reader informed of problems and solutions. In addition, policy statements and related material were sometimes included.

The pertinent research and statistical content in these reports is now contained in Research Report No. 3 in its three Volume III's. The two appendixes presented in this document contain most of the material not covered in Research Reports 3, 4, 5, 6 or this report. This document essentially replaces the ten prior Technical Reports, and none of the ten are now available for distribution.

WORKINC PAPERS

The Project produced ten Working Papers. Except for Working Paper No. 10 (discussed later in this chapter) all are now obsolete and

should not be retained by any readers who have received them. None are now available for distribution. Working Papers 1 through 7 were the field manuals covering a series of field tests of specific aspects of the methodology. All the tests resulted in revisions of definitions, scales, and procedures, so that none include current material.

Working Paper No. 8 was the field test manual used in the preliminary work done on finding General Intellectual Skills. It is not likely that this document will be of interest to the general reader. The results are described in Research Report No. 3, Part B, Volume III.

Working Paper No. 9 was never used in the field. The Knowledge Classification System and Knowledge Scale were subjected to dry runs before a full field test. Sufficient revisions were required to make Working Paper No. 9 obsolete before it was used. The pilot test at the Dr. Martin Luther King, Jr. Center was the first field test for the Knowledge System.

RESEARCH REPORTS AND WORKING PAPER NO. 10

The documents described in this section represent final research results with respect to the objectives of Phases I, II, and III. However, several of the reports will be subjected to further revision during the Demonstration Phase of the Health Services Mobility Study. Such reports will be indicated as having "limited distribution." This means that HSMS reserves the right to decide on the appropriateness of requests for the documents. There is no authorization for use by third parties. Other documents may be obtained by writing to the appropriate publisher or can

be made available to primary users by contacting the Health Services Mobility Study.

Research Report No. 1

The first HSMS Research Report was Train Practical Nurses to Become Registered Nurses: A Survey of the PN Point of View.[1] The report discusses the responses of 2,361 licensed practical nurses (LPN's) working in New York City municipal hospitals. The questions posed covered their interests and needs with regard to training to become registered nurses (RN's).

In addition to providing a breakdown of responses by demographic characteristics, the document provided additional information. The document reports that there is marked employee interest in upgrading training and a willingness to contribute time and effort for such training among LPN's. The Report discusses how educational institutions can cooperate to shorten training time through exemptions, transfer of credit, use of equivalency testing and redesign of curricula. It indicates how a coordinated cycle of training for several steps in a job ladder designed to fill upper-level vacancies can minimize costs. It proposes several alternative educational sequences and alternative means to fund released-time training and tuition costs, including the design and strategy for a nursing sequence from nurse aide to staff nurse with an exit point at practical nurse, and another sequence from practical nurse to staff nurse.

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[1] The author is Eleanor Gilpatrick.

This document appeared in June, 1968,and was accepted for publication by the Hospital Research and Educational Trust (Chicago) in September, 1969. The publishers assure us that they have been beset by technical delays and that publication is now expected by the summer of 1972. The document must be obtained through the publisher, unfortunately, since other copies have long since been distributed. The ERIC system may be contacted for an early, unrevised photocopy.

Research Report No. 2

Research Report No. 2 was published by Praeger Publishers in 1970.[2] The document examines the organizational context within which New York City Municipal hospitals are staffed, and describes factors affecting employment such as wages, vacancies, credentialing and mobility within the system. The Report concludes that the bars to upward mobility are not due to entry-level shortages, and that the major impediments to upward mobility are a lack of organizational commitment to job ladders, credential barriers, redundancy of educational programs, and the fact that middle and upper-level jobs require a good deal of investment in academically-based education. The Report offers suggestions on mobility, job pathways and training. It calls for the development of a strong manpower function and a commitment to a job ladder approach to filling vacancies, and offers some models. It further shows how a job ladder approach can serve the

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[2] Eleanor G. Gilpatrick and Paul K. Corliss, The Occupational Structure of New York City Municipal Hospitals, New York: Praeger Publishers, 1970.

needs of management by filling vacancies, and can serve the needs of the employees by providing upward mobility.

The document may be obtained from the publishers.

Research Report No. 3

Research Report No. 3 is entitled A Job Analysis Method For Developing Job Ladders and For Manpower Planning. This document is divided into three Parts and nine Volumes. Together, the volumes comprise the job analysis methodology of the Health Services Mobility System.

The Part A documents deal with task analysis; Part B covers the skills; and Part C covers the Knowledge System and the computer work. Each Part has three volumes including a method manual, a job analyst training manual, and the literature review and statistical results of testing for the respective Part. All nine volumes are on "limited distribution." The documents are described below.

Research Report No. 3. Part A: Task Identification.
Volume I: A Manual for Task Identification.
By Eleanor Gilpatrick.

This manual serves both as an introduction to the overall HSMS approach and methodology and as a working manual for task identification. Chapter 1 is an introduction to the HSMS approach to manpower development and to task identification in particular. Chapter 2 explains how the manual is used. Chapter 3 outlines the scheduling and planning necessary to arrange for orderly data collection. It serves as a model for Parts B and C, as well. Chapter 4 presents the definitions and rules used

in the task identification procedure and elaborates on specific aspects of these. Chapter 5 presents a step-by-step list of the events related to data collection for task identification. Chapter 6 directs the data processors in preparation and analysis of reliability and accuracy measures, and Chapter 7 directs the data processors in the conversion of the analysts' field data into "hard data," or "Master Tasks," as they are called. The identification of overlap tasks (tasks appearing in more than one performer's job), is also discussed in the chapter. Chapter 8 indicates ways in which the task data can be used for analytic purposes before skill scaling and knowledge identification is done.

Research Report No. 3. Part B: Skill Dimensions of Tasks.
Volume I: A Manual for Scaling Tasks on Skills.
By Eleanor Gilpatrick and Earl E. Davis.

This is the working manual for skill scaling. Chapter 1 presents the general concepts to be used in skill scaling. Chapter 2 presents the sixteen skill scales and the Task Frequency scale with a brief discussion of each. Chapter 3 presents a step-by-step list of the events related to data collection for skill scaling. Chapter 4 directs the data processors in preparation and analysis of data to measure the reliability and accuracy of the analysts' scaling. Chapter 5 directs the data processors in the conversion of the analysts' field data into "hard data" for scale values for the "Master Tasks."

Research Report No. 3. Part C: Knowledge Identification and Scaling of Tasks. Volume I: A Manual For Knowledge Identification and Scaling. By Eleanor Gilpatrick and Philip von Esch.

This volume is a working manual for identifying the knowledge needed to perform job tasks and for scaling the knowledge categories identified for each task. Chapter 1 presents the general concepts which underlie the Knowledge Classification System and the Knowledge Scale. It also includes a brief history of the Knowledge Classification System and some guidelines for the user. Chapter 2 presents a detailed description of the Knowledge Classification System. It covers the definitions, the organizing principles, the arrangement of the System, and rules for its use. Chapter 3 is the Knowledge Classification System itself, followed by an Index and Glossary. Chapter 4 presents a step-by-step list of the events related to data collection for knowledge identification. Chapter 5 directs the data processors in the preparation and analysis of data to measure the reliability and accuracy of knowledge identification. Chapter 6 is a step-by-step list of the events related to data collection for knowledge scaling. Chapter 7 directs the data processors in preparation and analysis of data to measure the reliability and accuracy of knowledge scaling. Chapter 8 directs the data processors in the conversion of the analysts' field data into "hard data" knowledge identifications and scale values for the "Master Tasks." It describes the use of the Knowledge Classification System as a filing device and also discusses the use of Knowledge System data.

Research Report No. 3. Part A: Task Identification.
Volume II: Training Job Analysts in Task Identification.
By Irene Seifer and Eleanor Gilpatrick.

This volume is the first of a series of three training manuals each of which concentrates on a phase of the job analysis methodology developed by the Health Services Mobility Study (HSMS). The contents of this document deal with task identification and are designed for use with Part A, Volume I of the Report: "A Manual For Task Identification." In addition, this volume presents material which is applicable in all of the stages of task analysis. The two other training manuals deal with the specific additional work covered by a particular stage of the method involved. Taken together, the three training manuals constitute a training program for job analysts in the use of the HSMS task analysis methodology.

Chapter 1 serves as an overall introduction to the manual and advises the reader on how to use it as a workbook. It includes a code of behavior for the analyst. Chapters 2 through 7 are in lesson form, with review questions and answers provided for each. Chapter 2 provides a brief overall introduction to the concepts and definitions used in the HSMS task analysis method. Chapters 3, 4 and 5 are focused on details of the definitions and rules used in task identification. Chapter 6 concentrates on how the rules and definitions are to be reflected in writing up the data collected. Chapter 7 covers similar material, but this time in terms of the procedures to be used. Chapter 8 is a guide to observation and interview techniques. It deals with the relationship of

the analyst to the persons involved in the task analysis. This chapter is applicable to all of the training manuals.

Research Report No. 3. Part B: Skill Dimensions of Tasks. Volume II: Training Job Analysts in Skill Scaling. By Irene Seifer and Eleanor Gilpatrick.[3]

This volume is a training manual for rating tasks (which have already been identified) on the HSMS skill scales. Chapter 1 of this manual serves as a brief introduction to the training and explains how the manual is to be used as a workbook. Chapter 2 provides an introduction to the general concepts used in skill scaling. It briefly discusses skill scaling procedures, describes how task identifications are reviewed for correctness and completeness, and how tasks can be written up so as to facilitate skill scaling. Chapters 3 and 4 present the latest versions of the seventeen HSMS scales and explanations of how each is applied. Revisions of some of the scales, which were made as a result of the pilot test, are incorporated. Thus, the Part B, Volume II versions of the scales take precedence over those in Part B, Volume I. This manual uses examples of tasks identified in the field as an aid to training.

Research Report No. 3. Part C: Knowledge Identification and Scaling of Tasks. Volume II: Training Job Analysts in Knowledge Identification and Scaling. By Irene Seifer and Eleanor Gilpatrick.[4]

This volume is a training manual for use of the HSMS method of identifying the knowledge categories that are required to perform tasks

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[3] Part B, Volume II and Part C, Volume II are currently bound together in a two-part document.

[4] Ibid.

and for rating the levels at which the categories are required. This phase of the HSMS method is applied to tasks which have already been identified and rated on the skill scales. The manual offers elaboration, explanation, and clarification of the definitions and concepts of the Knowledge System as well as minor revisions. The manual presents discussions about the problems which can arise in the use of the method and ways to handle them. It also offers practice examples and exercises.

Chapter 1 of this manual serves as a brief introduction to the training and explains how the manual is to be used as a working companion to Part C, Volume I, the method manual. Chapter 2 provides a review of the general concepts used in knowledge identification and scaling. It briefly discusses the nature of the Knowledge Classification System and the Knowledge Scale.

Chapter 3 presents a set of clarifications and revisions of knowledge category names and meanings which were arrived at during the course of the pilot test; it then provides a practice exercise. Chapter 4 deals with the practical problems which arose during the use of the System in the pilot test and offers solutions as well as a discussion of the types of errors that can be made and ways to avoid them. This chapter uses examples of tasks identified in the field as an aid to training. In addition, an annotated bibliography on role-playing is included. It can be used as a means of gaining more information about techniques which can help develop the kinds of skills and insights required to properly apply the HSMS methodology.

Research Report No. 3. Part A: Task Identification.
Volume III: Data on Task Identification.[5]

The three Volume III's of Research Report No. 3 deal with literature reviews and statistical results. In this document Chapter 1 presents a comparison of task definitions as found in the leading job analysis methodologies currently in use. Chapter 2 reports on the pilot and field tests of the HSMS task definition and method, and discusses its reliability and validity. Chapter 3 presents the revisions in the definition and method which were warranted as a result of the statistical results of the pilot test and experiences with the method in the field.

Research Report No. 3. Part B: Skill Dimensions of Tasks.
Volume III: Data on Skill Scaling.[6]

In this document Chapter 1 briefly reviews the need for skill dimensions in job analysis, the literature in the field, and describes the development of the HSMS skill scales. Chapter 2 reports on the field tests of the scales and indicates the revisions which were adopted as a result of analysis of the pilot test data.

Research Report No. 3. Part C: Knowledge Identification and Scaling of Tasks. Volume III: Clustering Tasks Through Factor Analysis.[7]

This volume will be of interest to those who are applying the HSMS method and plan to include the stage of computer-based clustering of

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5 Part A, Volume III, Part B, Volume III, and Part C, Volume III are all currently bound together in a three-part document.

6 Ibid.

7 Ibid.

tasks. Chapter 1 presents tentative results on the first field test using the Knowledge Classification System and the Knowledge Scale. Chapter 2 describes the preparation of the data and the decisions made in preparation for factor analysis. Chapter 3 describes the factor analysis work and how analysis of the results is accomplished.

Research Reports Nos. 4 and 5

This document is entitled, Suggestions for Job and Curriculum Ladders in Health Center Ambulatory Care; A Pilot Test of the Health Services Mobility Study Methodology.[8]

This Report will be of interest to several types of audiences. First, as a report on the methodology, it will be of interest to anyone concerned with providing upward mobility and/or relieving upper level shortages. Second, for those concerned with providing upward mobility within patient care, the actual content of the pilot test titles and tasks and the recommended ladders have generalizable relevance. Third, for those concerned with providing the education for health care occupations, the skill and knowledge content of the results will also provide informative and suggestive insights. Finally, anyone interested in health care service delivery or in health manpower should find something of interest

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[8] By Eleanor Gilpatrick. The reader will note that the Report is listed as Research Reports Numbers 4 and 5. The original plan was to have separate reports on the job ladders and on the related curriculum ladders. However, once the analytical work was near completion, it became apparent that the two parts are too intimately intertwined to be presented as two separate documents. Since Research Reports Numbers 4 and 5 constituted the "Final Report" contracted for with the Health Services and Mental Health Administration, the designation was retained.

in the Report. The document has been submitted to review for possible publication, but a small quantity is available for distribution.

This document reports on an enormous amount of data. To provide the most readable and interesting format, much of the raw data, which would require several volumes, are not presented. The reader will be able to obtain raw data to meet his needs by contacting the Health Services Mobility Study. Appendix tables provide most of the background data needed for the reader who wishes fuller elaboration of the statements in the text.

Chapter 1 tells the reader about the approach of the Health Services Mobility Study and sets the methodology within a framework of current manpower problems in the health services industry. It also provides a summary of the pilot test results. Chapter 2 describes the HSMS methodology as it was applied, and presents a description of the pilot test and the titles it covered. Chapter 3 discusses the general results of the pilot test and their implications. Chapter 4 goes into greater detail and presents the actual task sequences identified by the method and the related curriculum content requirements. Chapter 5 talks about practical application of the results in job restructuring and curriculum, assuming no desire for major reorganization. Chapter 6 discusses more idealized applications of the results and presents job ladders that require job restructuring and redesigned curricula, assuming a willingness on the part of the institutions to undertake major reorganization. Chapter 7 comments on general policy and describes the spin-off applications of the method in performance evaluation and curriculum design.

Research Report No. 6

This report, A Model for the Use of Task Data in Performance Evaluation and Trainee Selection[9] focuses on the use of task data for the purpose of establishing objective, work-related standards for the evaluation of institutional or employee performance and for use in trainee selection in job ladder sequences. The document is available for "limited distribution," but has not yet been updated to reflect revisions made in the method during the pilot test.

Chapter 1 presents a brief review of the HSMS job analysis methodology and its data outputs. Chapter 2 provides a model for the normative evaluation of an institution's functioning in any specific area or in an individual or group of job titles. Chapter 3 deals with the more complicated model needed for trainee selection when prediction becomes relevant. Chapter 4 is addressed to the reader who is concerned with the methodological problems involved in predictive models. Chapter 5 offers a model which might be attempted if the HSMS premises for trainee selection were to be tested in an experimental design. The average reader will find that Chapters 1 through 3 are most relevant to his needs; the researcher will also wish to examine Chapters 4 and 5.

Working Paper No. 10

Working Paper No. 10 is entitled, Preliminary Models for Curriculum Analysis and Curriculum Ladder Design Using Task Data. The volume

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[9] By Earl E. Davis and Eleanor Gilpatrick.

is a tentative working model designed to be used in conjunction with task data resulting from the HSMS job analysis methodology. Some copies are available for distribution.

The purpose of this document is to present models which can be used in the curriculum analysis and design needed for educational ladders. It must be understood, however, that this document does not deal with the field of educational psychology in terms of how people learn or how to teach so that maximum learning is accomplished. It does not take a position on possible choices between classroom and clinical training. It does offer several insights into these areas.

Chapter 1 outlines the three types of curriculum analysis dealt with in the document and introduces some problems inherent in the use of task data for curriculum design. The three types of analysis are (1) to discover curriculum overlap, (2) to determine whether required parts of curricula are in fact needed, and (3) the design of curriculum ladders. Chapter 2 raises some conceptual and analytical problems involved in the appropriate use of task data for curriculum analysis and design, comments briefly on the literature in the field, and offers a tentative definition of a curriculum unit. Chapters 3, 4 and 5 present the actual models for the three analytical purposes. Chapter 3 presents two analytical models which accept existing courses and seek only to identify and eliminate redundancy. Chapter 4 presents an analytical model for assessing the justification for requirements in programs leading to licensure, degrees,

or certification in relation to the work objectives involved. Chapter 5 discusses the HSMS approach to the design of curricula which articulate with one another and reflect job ladders. It shows how task data and the analytical approach of the HSMS method can be both useful and suggestive with respect to curriculum content.

CHAPTER 6

FUTURE PLANS

The work of the Health Services Mobility Study has been conceived of by its Director as a combination of short and long range work objectives and applications. In short range terms, every phase along the way has usable results on at least three levels of application.

First, by virtue of the policy and strategy approaches implicit in the work, there have been usable strategies for others to apply. This has already resulted in changes in the thinking and policy of a considerable number of members of the health care community. Second, with the refinement of the method manuals and the job analyst training manuals the methodology has been and will continue to be directly usable by a limited number of institutions who wish to apply the method themselves. Third, the most widespread applications will be for those who wish to have access either to the data or to the prototypes and recommendations. Almost all of the applications described in Chapter 4 reflect this level of usage to one degree or another.

The work of task analysis alone could continue for a very long period of time considering the thousands of separate activities which are engaged in by health care institutions. After the design of job ladders and lattices, the work in developing instruments for performance evaluation as described in the model could also take a major research effort. This is equally true for the work in curriculum analysis which would result in educational ladders to match the job ladders.

In long range terms, Phases I, II and III represent developmental and pilot test phases. Now that the pilot test has been successful, the Demonstration Phase begins. In the coming months the Project will collect further data which will lead to additional proposals for job ladders in health occupations. Although the method will be available to users through HSMS publications, the main focus of the Health Services Mobility Study will be as the prime agent in applying the method and in providing technical support in disseminating and applying the results.

In the coming period the method will be refined and applied, and the results will be offered to the health community at large. It is also expected that developmental work will be done in the two related areas of curriculum analysis and design to parallel the job ladders, and in the application of the model for performance evaluation. Eventually, there could be an ongoing utilization of the methodology as a service function for the industry as a whole.

IMMEDIATE PLANS

The new funding period (starting in April, 1972) has some specific objectives to be achieved within the framework of the longer range objectives. They are as follows:

1. Collect task data in a major voluntary hospital: develop and recommend job ladders; and disseminate findings.
2. Make final revisions of the job analysis methodology and make this available.
3. Continue to develop and apply the work in performance evaluation and curriculum analysis to dovetail with the job

ladder recommendations; do this in cooperation with several health services institutions which indicate the possibilities of immediate application. This includes the development of guidelines for a curriculum ladder including an allied health occupation.

4. Make available basic task data, and provide guidance in their use at selected institutions.

5. Provide documentation as follows:

   a. Final Method Manuals.
   b. Reports on job and curriculum ladder recommendations to be used as prototype models.
   c. Progress reports on application experiences.

These limited objectives for the next eighteen month period take the Project nearer to its goal of promoting career mobility. They also provide for the immediate needs of the institutions in which the work will be done. The Project has already received requests to work with several institutions. In addition, the outputs of the period will provide other institutions with material for the varied uses to which the data and recommendations can be put.

The Health Services Mobility Study is happy to announce that the Demonstration Phase, which is the next funding period, will be jointly supported by the Manpower Administration of the Department of Labor and the Division of Allied Health Manpower, Bureau of Health Manpower Education of the Department of Health, Education and Welfare.

DETAILED PLANS

Task data will be collected at the Montefiore Hospital and Medical Center and will include nursing and X-ray functions among others

not yet specified. Task analysis at Montefiore is attractive for several reasons. First, this is a major voluntary hospital, and any results would have wide applicability. Second, since the Dr. Martin Luther King, Jr. Center is a part of the Montefiore complex, there is the possibility of doing task clustering with the data from both institutions. It would then be possible to identify mobility paths into and out of the two locations. This should be of great interest to many ambulatory care centers and especially to OEO Centers, since there has long been a problem in placing workers with Center-specific titles in other institutions at economically attractive levels. There will be the potential of comparing functions across locations. Third, Montefiore was the site of some of our early field testing,and warm relationships have been established with many people on the staff. This will greatly facilitate the work. Finally, Montefiore is one of the more innovative of the great voluntary hospitals, and the possibility that recommendations can be implemented is very good.

In the new funding period the method manuals will be revised to incorporate the findings of the pilot test. The resulting document(s) will be offered for publication and will be available for distribution to appropriate non-profit organizations.

In the coming period HSMS expects to provide major inputs to several educational institutions and expects to develop a curriculum analysis methodology in cooperation with their staff members. The Project will develop the guidelines for at least one educational ladder with at least one credentialed institution.

Eugenio Maria De Hostos Community College is a part of the City University of New York. Apart from the fact that it serves the South Bronx and is located near Montefiore and the Dr. Martin Luther King, Jr. Center, it is important because it is C.U.N.Y.'s flagship community college for health occupation training. From its inception, its new President, Candido deLeon,saw that its modular approach to education and its emphasis on health occupations makes it a natural focus for job ladders. The City University complex also incorporates a senior college program in health occupations at the Hunter College Institute of Health Sciences and at the Mt. Sinai Medical School. Thus, the potential for curriculum articulation exists.

The Study will be undertaking a cooperative venture with several outlying institutions. One of these is Community-General Hospital of Greater Syracuse where aspects of the HSMS approach have already been applied. Task data which reflect activities at Syracuse will be used to help revise and evaluate in-house training and performance. The work in the area of curriculum will also be made available and important results will be reported. The application of the methodology to Syracuse is significant because this hospital is a prototype for suburban, medium-sized hospital centers across the country.

We hope that the staff of the Dr. Martin Luther King, Jr. Center will find the results of the task analysis work useful and will wish to continue to cooperate in the application of the job ladder recommendations and the performance evaluation and curriculum analysis methodol-

ogy. This experience will round out the relationship with the parent organization at Montefiore and the key educational institutions. The results should have wide applications.

A number of institutions have expressed an interest in the task data for a variety of applications. All technical support and co-operative work will be reported in progress reports. Three requirements will have to be met before any technical support is provided:

1. The institution must be a primary user such as a health care delivery institution or an educational institution.
2. The institution must agree to use the basic data solely for internal needs and must agree not to turn these over to secondary users.
3. The institution must agree to report on its experience with the material and data so that the results can be disseminated.

The Project embarks on its Developmental Phase with the good wishes of many friends and hopes to earn many more in the coming period by delivering materials which are needed and usable by the health community at large.

SELECTED BIBLIOGRAPHY

1. Altman, James W., Research on General Vocational Capabilities (Skills and Knowledges), Final Report, Pittsburgh: American Institutes for Research, 1966.

2. Anastasi, Anne, Psychological Testing, New York: The Macmillan Company, 1961.

3. Anderson, O. R., Structure in Teaching, New York: Teachers College Press, 1969.

4. Ausubel, D. P., "The Use of Advance Organizers in the Learning and Retention of Meaningful Verbal Material," Journal of Educational Psychology, LI, 1960, 267-272.

5. Barlow, Melvin L., et al., Research and Demonstration Project for Curriculum Development and Teacher Education in the Allied Health Occupations, Various Reports, University of California at Los Angeles, Division of Vocational Education, Allied Health Professions Project, 1969-1972.

6. Beauchamp, G. A., Curriculum Theory, Wilmette: Kagg Press, 1961.

7. Bloom, B. S. (Ed.), A Taxonomy of Educational Objectives: Handbook I, The Cognitive Domain, New York: Longmans, Green, Co, 1956.

8. Bright, James R., "The Relationship of Increasing Automation and Skill Requirements," in The Employment Impact of Technological Change: Technology and The American Economy, Appendix Volume II, Washington, D. C.: the National Commission on Technology, Automation, and Economic Progress, 1966, 201-316.

9. British Standards Institute, Universal Decimal Classification System, London: International Commission on Decimal Classification of the International Federation For Documentation, etc., 1961.

10. Bruner, J. S., The Process of Education, Cambridge: Harvard University Press, 1962.

11. Cain, Glen, Hansen, W. Lee, and Weisbrod, Burton A., "Occupational Classification: An Economic Approach," Monthly Labor Review, Vol. 90, No. 2, Feb., 1967, 48-52.

12. Christal, Raymond E., "Implications of Air Force Occupational Research For Curriculum Design," Report Available from Minnesota Research Coordinating Unit for Vocational Education, University of Minnesota, undated.

SELECTED BIBLIOGRAPHY (continued)

13. Crawford, Meredith, Concepts of Training, in Robert M. Gagné (Ed.), Psychological Principles in Systems Development, New York: Holt, Rinehart and Winston, 1962.

14. Cronbach, L. J., Essentials of Psychological Testing, New York: Harper and Brothers, 1960.

15. Davis, E. E., "Methodological Study of Behavioral and Semantic Differential Scales Relevant to Intercultural Negotiations," Technical Report #32, ONR Contract #177-442 Nonr-1834 (36), Urbana: University of Illinois, 1966.

16. Davis, E. E., Triandis, H. C., An Exploratory Study of Intercultural Negotiations, Technical Report #26, ONR Contract #177-472, Nonr-1834(36), Urbana: University of Illinois, 1965.

17. Decker, John P., A Functional Analysis of Paramedical Occupations as a Foundation for Curriculum Development, Phoenix, Arizona: Health Services Education Association, 1967.

18. Edwards, Allen, Techniques of Scale Construction, New York: Appleton-Century-Crofts, Inc., 1957.

19. Fine, Sidney A., A Systems Approach to Job Design and Manpower Utilization, Seminar Workshop (in 5 Parts), Washington, D. C.: The W. E. Upjohn Institute for Employment Research, 1969.

20. Fine, Sidney A., Functional Job Analysis Manual, Manpower Data Collection Study--Phase II, Washington, D. C.: The W. E. Upjohn Institute for Employment Research, undated.

21. Fine, Sidney A., "Nature of Skill: Implications for Education and Training," Proceedings, 75th Annual Convention of the American Psychological Association, 1967, 365-6.

22. Fitts, Paul M., Posner, Michael I., Human Performance, Belmont, California: Brooks/Cole Publishing Company, 1967.

23. Fleishman, Edwin A. and Hempel, Walter E., "A Factor Analysis of Dexterity Tests," Personnel Psychology, Vol. 7, 1954, 15-32.

24. Fleishman, Edwin A., "Dimensional Analysis of Psychomotor Abilities," Journal of Experimental Psychology, Vol. 48, No. 6, 1954, 437-454.

25. Fleishman, Edwin A., "Dimensional Analysis of Movement Reactions," Journal of Experimental Psychology, Vol. 55, No. 5, 1958, 438-453.

SELECTED BIBLIOGRAPHY (continued)

26. Fleishman, Edwin A., and Ellison, Gaylord D., "A Factor Analysis of Fine Manipulative Tests," Journal of Applied Psychology, Vol. 46, No. 2, 1962, 96-105.

27. Fleishman, Edwin A., "The Description and Prediction of Perceptual-Motor Skill Learning," in Robert Glaser (Ed.), Training Research and Education, New York: J. Wiley and Sons, Inc., 1962, 137-176.

28. Freeberg, Norman E., "Construct Validity of a Paper-and-Pencil Test of Manual Dexterity," Perceptual and Motor Skills, Vol. 22, No. 1, 1966, 200.

29. Gagné, R. M., The Conditions of Learning, New York: Holt, Rinehart and Winston, 1967.

30. Ghiselli, E. E., The Measurement of Occupational Aptitude, Berkeley: University of California Press, 1955.

31. Guilford, J. P., The Nature of Human Intelligence, New York: McGraw-Hill Book Co., 1967.

32. Haggard, Donald F., The Feasibility of Developing a Task Classification Structure for Ordering Training Principles and Training Content, Fort Knox, Kentucky: U. S. Army Human Research Unit, 1963.

33. Harman, Harry H., Modern Factor Analysis, Chicago: University of Chicago Press, 1967.

34. Hays, W. L., Statistics, New York: Holt, Rinehart and Winston, 1963.

35. Hempel, Walter E., Jr., and Fleishman, Edwin A., "A Factor Analysis of Physical Proficiency and Manipulative Skill," Journal of Applied Psychology, Vol. 39, No. 1, 1955, 12-16.

36. Hull, C. L., Aptitude Testing, Yonkers, New York: World Book Company, 1928.

37. Inlow, G. M., The Emergent in Curriculum, New York: John Wiley & Sons, Inc., 1966.

38. Jackson, Vivian C., Task Analysis, A Systematic Approach to Designing New Careers Programs, New York: New Careers Training Laboratory, New York University, 1971.

39. Jones, Francis E., A Systematic Analysis of Army Training Requirements as the Basis of More Generalized Training Research, Arlington, Virginia: Armed Services Technical Information Agency, 1961.

40. Kibler, R. J., Barker, L. L., and Miles, D. L., Behavioral Objectives and Instruction, Boston: Allyn and Bacon, Inc., 1970.

41. King A. R., and Brownell, J. A., The Curriculum and the Disciplines of Knowledge, New York: John Wiley & Sons, Inc., 1966.

42. Kirkpatrick, J. J., Ewen, R. B., Barrett, R. S., and Katzel, R. A., Testing and Fair Employment, New York: New York University Press, 1968.

43. Klaus, E. J., Gosnell, D. E., Reilly, P. A., Taylor, J. A., Controlling Experience to Improve Nursing Proficiency: Categories of Nursing Performance, Report No. 2, Pittsburgh, Pennsylvania: American Institutes for Research, 1968.

44. Klaus, D. J., Gosnell, D. E., Chowla, M. J., Reilly, P. A., Controlling Experience to Improve Nursing Proficiency: Determining Proficient Performance, Report No. 3, Pittsburgh, Pennsylvania; American Institutes for Research, 1968.

45. Krathwohl, D. R., The Taxonomy of Educational Objectives - Its Use in Curriculum Building, in C. M. Lindvall (Ed.), Defining Educational Objectives, Pittsburg: University of Pittsburg Press, 1964.

46. Levin, Tom, Russell, Tanya, Lesh, Seymour, et al., "Transitional Report of the Curriculum Research Group," Transitional Report, Albert Einstein College of Medicine - Lincoln Hospital Health Careers Program, New York: Unpublished, 1968 (Two Volumes).

47. Lopez, F. M., Evaluating Employee Performance, Chicago: Public Personnel Association, 1968.

48. Mager, R. F., Preparing Instructional Objectives, Palo Alto, California: Fearon Publishers, 1962.

49. Miller, R. B., "Task Description and Analysis," in R. M. Gagné, (Ed.), Psychological Principles In System Development, New York: Holt, Rinehart and Winston, 1966, pp. 187-228.

50. Morsh, Joseph E., Madden, Joseph M., Cristal, Raymond E., Job Analysis in the U. S. Air Force, Arlington, Virginia: Armed Services Technical Information Agency, 1961.

51. Morsh, Joseph E., "The Analysis of Jobs--Use of the Task Inventory Method of Job Analysis," in Edwin A. Fleishman (Ed.), Studies in Personnel and Industrial Psychology, Homewood, Illinois: The Dorsey Press, 1967, 4-11.

SELECTED BIBLIOGRAPHY (continued)

52. National Seminar on Modular Flexible Scheduling, The Flexibly Scheduled School of 1980: A Report, Dayton: Institute for Development of Educational Activities, 1971.

53. Otis, Jay, and Leukhart, Richard H., Job Evaluation: A Basis for Sound Wage Administration, Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1954.

54. Parker, James F. Jr., Reilly, Raymond E., Dillon, R. F., Andrews, Thomas G., Fleishman, Edwin A., Development of a Battery of Tests For Measurement of Primary Perceptual-Motor Performance, Arlington, Virginia: BioTechnology, Inc., 1965.

55. Saunders, D. R., "Moderator Variables in Prediction," Educational and Psychological Measurement, 1956, Vol. 16, 209-222.

56. Seashore, Robert H., "Work and Motor Performance," in S. S. Stevens (Ed.), Handbook of Experimental Psychology, New York: J. Wiley and Sons, 1951, 1341-1362.

57. Sjogren, Douglas, and Sahl, Robert, Review of Research on Common Job Behaviors, Washington D. C.: Bureau of Research, Office of Education, U. S. Department of Health, Education, and Welfare, 1966.

58. Sjogren, Douglas, Schroeder, Wayne, Sahl, Robert, The Identification of Common Behavioral Factors as Bases for Pre-Entry Preparation of Workers for Gainful Employment, Washington D. C.: Office of Education, U. S. Department of Health, Education, and Welfare, 1967.

59. Smith, B. O., Fundamentals of Curriculum Development, Yonkers-on-Hudson: World Book Company, 1957.

60. Springer, Doris, "Ratings of Candidates for Promotion by Co-workers and Supervisors," in, T. L. Whisler and Shirley F. Harper (Eds.), Performance Appraisal: Research and Practice, New York: Holt, Rinehart and Winston, 1962.

61. Stolurow, L. M., Peterson, T. I., Cunningham, A. C., (Eds.), Computer Assisted Instruction in the Health Professions, Newburyport, Massachusetts: ENTELEK, Inc., 1970.

62. Swenson, Gardner, Providing for Flexibility in Scheduling and Instruction, Englewood Cliffs, N. J.: Prentice-Hall, 1966.

63. Tucker, L. R., "The Extension of Factor Analysis to Three-Dimensional Matrices," in Fredericksen (Ed.), Contributions to Mathematical Psychology, New York: Holt, Rinehart, and Winston, 1964.

SELECTED BIBLIOGRAPHY (continued)

64. Tucker, L. R., "Some Mathematical Notes on Three-Mode Factor Analysis," Psychometrika, Vol. 31, 1966, 279-311.

65. Tucker, Ledyard R., and Messick, Samuel, "An Individual Differences Model for Multidimensional Scaling," Psychometrika, Vol. 28, December, 1963, 333-367.

66. U. S. Department of Labor, Bureau of Employment Security, Dictionary of Occupational Titles, Volume I: Definitions of Titles; Volume II: Occupational Classification; and Supplement, Washington, D. C.: Superintendent of Documents, 3rd edition, 1965.

67. U. S. Department of Labor, Manpower Administration, Bureau of Employment Security, Training & Reference Manual for Job Analysis, Washington, D. C.: U. S. Government Printing Office, 1965.

68. U. S. Department of Labor, Manpower Administration, A Handbook For Job Restructuring, Washington, D. C.: U. S. Government Printing Office, 1970.

69. Verdier, Paul A., Basic Human Factors for Engineers: The Task Analysis Approach to the Human Engineering of Men and Machines, New York: Exposition Press, 1960.

70. Wallenstein, Robert J., Knowledges Commonly Useful in Twelve Allied Health Occupations, Project No. OE 7-0031; Contract No. OE G-4-7-070031-1626; Report No. 25, Washington D. C.: Department of Health, Education and Welfare, 1968.

71. Willard, Richard, A School Schedule Building System Designed for Educational Administrators, Unpublished Ed.D. Dissertation, Cambridge: Harvard University Graduate School of Education, 1969.

72. Wheaton, G. R., Farina, A. J., Baker, W. J., in E. A. Fleishman, R. G. Kinkade, A. N. Chambers, (Eds.), Development of a Taxonomy of Human Performance: A Review of the First Year's Progress, Technical Progress Report 1, Silver Spring, Maryland: American Institutes For Research, 1968.

APPENDIX A

A GLOSSARY OF CAREER MOBILITY TERMS

Occupational Mobility is the movement of individuals from one job to another within institutions or across institutions. Upward mobility implies that the movement is in the direction of increased status, income or responsibility. The term is to be used here in the context of a single institution. It is assumed that if an institution is structured so as to provide opportunities for upward occupational mobility for its employees, they will, in turn, be motivated to remain, and to improve their work performance.

The provision of opportunities in an institution for occupational mobility need not imply that all employees want it, that all are competent to achieve it, nor that all can expect it. In providing opportunities for upward mobility, the institution provides itself with a source from which to draw on to fill upper-level vacancies and solve shortage problems, as well as a way to reward employees who can and wish to move ahead.

Job Families are groupings of jobs which are related because they draw on similar skills and subject matter. These are also called job clusters. A given job family would include upper, middle, and lower level jobs, and perhaps have several jobs at a given wage level. The similarity of skills and knowledge required among jobs in a family implies that experience in one is easily transferred to the work in another. Movement between jobs at a given level would therefore require a minimal amount of additional training. The transferability of training to higher levels within a family assumes that there is a common educational base on which to build. It is assumed that moving up within a job family would require a minimum of additional training for the employee rather than his being introduced to totally new sets of skills and knowledges.

Job Ladders are sequences of promotional steps linking jobs which ideally should be in the same job families. Traditional job ladders in industry provide such steps where no additional formal education has been needed to move up a ladder. In the health field, however, there are educational barriers to upward movement because experience in the lower-level job may not be sufficient for performance in the next higher job. Therefore, the ladders cannot be promotional unless the required additional education is provided to trainees while they are in the lower-level jobs. The ladder concept refers to the relationship of jobs rather than individuals.

Career Ladders are the same as job ladders except that the term implies that a professional job is reached at the top of the ladder. Therefore, it is most probable that promotional lines in career ladders are not achievable without the provision of formal educational programs as well as any relevant on-the-job training.

Job Lattices or Career Lattices are networks of job ladders which allow for linkages of laterally related jobs. That is, entry-level and intermediary-level jobs which are related to more than one job family can be rungs on several job ladders. Where there is transferability of skills and knowledge at a given level there can be cross-over options and a choice of promotional pathways. The principle involved is that the skills and knowledge used in a given job may serve as a basis for more than one specialty, and that a given specialty may build on more than one kind of prior preparation. The entry to specific professional jobs could be reached in a lattice by more than one promotional line or sequence. Conversely, a given entry level job could be the first step towards more than one profession.

Upgrading (when the term is applied to an employee) is the movement from one title and wage level up to a new job title at a higher wage level in a given institution. "Promotion" is a synonym. Movement along a job ladder is one form of upgrading.

Upgrading Training is the training of an employee while he is employed in a current job to qualify for a higher-level job. Upgrading training in a career ladder means that preparation for a higher-level, related job builds on the skills and knowledge required in the current job.

Educational Ladders are series of related educational courses or programs which fulfill the educational requirements for all the jobs in a ladder and which provide for continuous educational movement along the ladder from entry level to professional levels, but with exit credentials for all the intermediary jobs involved along the way. Ideally, such a program would not require repetition of course work and would be designed so that educational institutions at higher levels would accept the course work at lower levels.

Career ladders in health cannot be planned without planning educational ladders. This is because the upper-level jobs are usually reachable only through degree, licensure, or other credential requirements. At present, curricula for health occupations are terminal in nature, and movement from one job level to another requires "starting from scratch" in each course of study.

Career Mobility Program is an interrelated set of programs within an institution to implement the concept of promotion from within. It includes the provision of the necessary education and training. The components would include identification of the sequences, i.e., the entry-level, intermediary and professional-level jobs involved. (There would normally be shortage occupations at upper levels.) There would be provision for proper educational courses, credentialing, released-time training, and an orderly sequence of trainee selection, trainee evaluation, and placement. With this might go remedial training, counseling, and a general orientation of supervisory personnel to the program.

Job Analysis is any process of identifying and evaluating the work activities associated with a given job title. The methods vary according to purpose. The industrial engineer is concerned with work sequences and time; the wage and salary administrator attempts to isolate and rate activities in terms of payment levels. For the purpose of career ladder development, job analysis breaks work into activities whose skills and knowledge requirements can be identified and rated.

Task Analysis is a form of job analysis in which the work activities of a job are separately identified and studied. Any given person's job is the sum of the work activities or tasks assigned to him or done by him. Task analysis may include identifying and rating the skills and knowledge needed for each task. The unit of work activity called the "task" usually is of such a size that a meaningful production output can be associated with it and it can be shifted from one job to another. The interrelationship of tasks is what underlies the development of job families and the creation of job ladders and lattices.

Job Restructuring is the process of reorganizing or reassigning work activities to a job title or to an employee in a job. When there are vacancies at high levels and impacted workers at low levels in a job family, it is often possible to create intermediary jobs to form a ladder. This can also mean identification of tasks assigned to several jobs so that they can be assigned to a job at an appropriate level. It can also mean assigning tasks to jobs so that jobs are composed of tasks which draw on related skills and knowledge at similar and appropriate levels. Job restructuring in these instances permits the institution to conserve its supply of highly skilled and educated manpower by making maximum use of their training. At the same time, it makes it possible for lower level staff to rise to higher income and more productive work in a relatively short space of time.

When it is recognized that there is transferability within skill and knowledge categories the jobs on ladders need not be made up merely of repetitive task assignments. Job enlargement within broad skill and knowledge families can be achieved by increasing the variety of tasks using similar skills and knowledges.

Exemptions, Waivers and Advanced Standing are offered by schools that acknowledge that a given trainee does not require specific parts of course programs. Since an expensive part of career ladder programs is the tuition and training costs, there is an advantage in eliminating overlapping course requirements. In addition, prior job exerience and prior educational experiences may often make certain required course work unnecessary and redundant for certain individuals. Course credits need not always be provided; sometimes requirements are simply eliminated. Where a fixed number of accumulated course credits are required, however, exemption with credit or advanced standing for prove achievement levels is a desirable objective. Such arrangements can be worked out and applied in cooperation with state educational bodies and educational institutions.

Proficiency Examinations measure the competence of individuals with respect to specific work or related activities or with respect to academic achievement. Proficiency examinations for academic course work are sometimes called equivalency examinations, while examinations to determine work proficiency levels may be called performance evaluation tests or work sampling tests. Licensure examinations may cover both academic and work content.

In contrast, aptitude tests do not directly measure academic or work proficiency, but, indirectly, through the use of selected test items, attempt to measure potential to do work or predict success in the future in certain broad lines of endeavor.

Equivalency Tests are geared to find whether a given individual can be considered to have achieved the level of knowledge represented by specific educational programs or courses at given academic levels. Grades on such examinations are used for exemption of individuals from required courses, for exemptions with course credits, or for entrance with or without advanced standing into course programs.

The General Equivalency Diploma Exam (or High School Equivalency Diploma Exam) tests for academic knowledge at the high school level. No formal educational courses are required to take the examination; persons who successfully pass are awarded a High School Equivalency Diploma which enables them to qualify for jobs which require a High School Diploma. Many colleges accept the Equivalency Diploma for admission to course work, and thus the way is open to the next educational rung.

The College Level Examination Program is a national program of examinations developed by the College Entrance Examination Board. It can be used to evaluate the college level achievement of persons without formal education. An individual can obtain credits and advanced placement within an academic program by virtue of his test scores. Persons in career ladder programs can therefore enter into advanced programs.

In New York State the College Proficiency Examination Program develops tests to evaluate the extent to which individuals display a knowledge of specific courses. These cover a range of academic subjects, as well as professional courses such as nursing subjects, on both the associate and baccalaureate degree levels.

Performance Evaluation refers to tests of work performance. Since courses for health occupations include clinical work, life experience may often be the source of learning of required skills. Tests which evaluate work performance may thus be used for credits, advanced standing, or exemptions. They can also be used for trainee selection and evaluation.

Core Curriculum refer to educational course materials which are common requirements for a number of programs. These units of study can therefore be offered to students preparing for various jobs in a ladder or several different jobs in a lattice. Once they are identified they provide the basis for breaking up curricula into units which need not be repeated once they are taken, regardless of which educational program claims them.

Career Mobility Consortia is an association of institutions who wish to achieve a common end through the pooling of resources. Career ladder programs require the cooperation of hospitals, educational institutions, professional associations, and government. They also require a large enough number of workers-in-training to be economically feasible. For small hospitals a pooling of efforts can make possible access to facilities, special programs and funding which might not be available to them as single entities. The consortium is therefore a means of achieving the purposes of a career mobility program.

APPENDIX B

TECHNICAL SUPPORT FOR BUILDING JOB AND EDUCATIONAL LADDERS

Oral Presentation to the National Manpower Policy Task Force
Conference on Upgrading and New Careers
March 20, 1970

The Health Services Mobility Study is funded by OEO, Labor and the Public Health Service. The topic of my presentation, "Technical Support for Building Job and Educational Ladders," describes our project. We are developing and testing a methodology which can be viewed as a technology for designing job ladders and the educational ladders needed to carry people up the job ladders. Our support function lies in our teaching the method, helping others to use it,and reporting our own results. Our method is generic to any industry; however, we are working primarily with health care jobs.

You have before you a two-part document. The first will be more or less adhered to in my oral presentation. Since I did not wish to take the time in these short 15 minutes to describe the methodology which we are developing in detail, this is done in the second section of the document you have before you.[1] Suffice it to say that our method is based on the assumption that, if we could identify and rate the skills and knowledge which are required in job tasks, we could develop promotional ladders within institutions which would reflect the interrelatedness of tasks. This would take advantage of the transferability and hierarchical relationship among levels of skill and knowledge, and would

[1] The second part was a description of the methodology and is not presented here.

minimize the amount of training effort required to move people up within organizational contexts.

CONCEPTUAL ISSUES

I wish to step back from a description of our approach for the moment and direct my main attention to the key issues, as I see them, which surround the relevance of possibilities for successful implementation of any technical support we could offer. Two of the issues are highlighted by language in the Conference agenda itself; I will raise two others with you as well.

Why New Careers?

The title of this Conference is "Upgrading and New Careers," and herein lies a problem. I should like to make it very clear that I do not endorse the concept of new careers, per se. The reason is that I object to this stress on the word "career" and the stress on the word "new." I think that these qualities could be side effects of what is done in the area of manpower development, but they cannot be the points of origin. What I mean is this: if you conceive of an industry having labor requirements for the production of goods and services, with the proportions of jobs needed to produce these goods and services increasing in the middle and upper skill levels, then we can understand why we find increasing shortages in the middle and upper skill levels, and hard core unemployment a continuing problem. The health industry is a prime example of an industry with growing shortages at levels which require education-

ally-based skill and knowledge tra'ning, much of it credentialed, and with few low level shortages.

It becomes increasingly important for institutions to be able to draw on their own internal labor forces so that their people at bottom levels can move up to fill these deepening higher level shortages.

In such a context the word "upgrading" is meaningful and the words "job ladder" are meaningful, but the words "career" and "new" are not necessarily meaningful. It may be that an upgrading sequence truly offers the quality of "career" at the end. But to talk about entry level jobs or those one step up as "careers" is clearly a misnomer and a euphemism. And whether or not the restructuring which often is required for building ladders necessarily produces something new, is really a function of the goods and services which are demanded, as these change, and the technologies used to produce them, as these change.

Given this context, "upgrading" has a meaning in terms of the organic requirements of industry (in any kind of a market economy, free or otherwise). The focus would be, in such a context, on the provision of technical support to permit industry, both public and private, to make maximum use of existing manpower with a minimum amount of training time involved.

Training workers for entry level (or para-professional) work, then, is put in its proper focus. It is a response to newly opened entry level jobs which have been vacated by upgraded workers, and not the orig-

inating push against the already impacted, entry-level employed poor. This is a different context, I suggest, than the one which is the basis for much poverty legislation. That approach views the poor as unemployed, as hard core, and as handicapped, and sets out to provide jobs in an economic vacuum, ignoring organizational or labor market functioning, in a context of altruism.

An Industry Is An Industry

My second objection to language is in the same vein. It relates to the fact that this No. II Session is called, "Federally Supported Upgrading In Industry" and Session IV is called, "New Careers and the Service Sector." The idea that industry means private sector, non-service,and that you don't have an industry when it is service or public sector, is totally alien to my thinking as an economist.

It seems to me that every industry, private or public, every industry, goods-producing or service-producing, has got to put together labor and capital and management know-how in the production of goods and/or services. To differentiate among these in terms of appropriate manpower policy, I believe, leads us down the wrong track. It has made it possible, it seems to me, to separate what is being done in manpower development in the service sector from the hard thinking of cost analysis and of systems approaches. I think that this is a disservice, not only to manpower policy, but to the people and organizations involved.

I have the abiding faith that, if a solution is inorganic and not appropriate to its context, it will not be long sustaining or self-sustaining. And if it is not long sustaining, and if government manpower policy has been built around fostering programs which are not essentially self-sustaining in organizations, then we face the danger that the entire attention to having a manpower policy will be discredited. What should be discredited are ill-conceived programs which do not reflect the realities of industrial and human systems.

Job Ladders and Educational Ladders

Our methodology starts with task analysis of the work being done in the organization. After job analysis and job ladder design we will be identifying the curriculum ladders needed for the upgrading of the employees involved. At this point we run into another major conceptual problem.

It has been traditionally assumed that when someone is going to school he is not a worker, and that when he is a worker he is not going to school. Labor force participation has been considered to be essentially incompatible with educational participation. This means that the educational system, per se, is not geared to the needs of employed workers who may be studying on a half-time basis in preparation to moving up in a related skill and knowledge hierarchy. It also means that educational programs are all terminal in concept: at the high school level, in a technical school, in a community college - and even beyond. This creates redundancies in curriculum requirements for upwardly mobile people. For

example, the nurse aide is trained, but gets no advanced standing in a Practical Nurse school. The LPN is trained, but gets no credits towards an associate degree in nursing (RN). The associate degree nurse has great difficulty getting two years of advanced credits in a baccalaureate degree nursing program.

All of this has separated "training" from "education" to the detriment of those who are required to have formal education to reach the upper level jobs in their industry. Another result is that the educational system itself has not really seen its function in the whole area of manpower development. In addition, Government legislation in the field of manpower development has not been built around the existence of educational institutions (formal, credentialed educational institutions). Please notice that there is not one educator here today.

I am setting aside for the moment the question of whether credentialed occupations and those which require formal ,higher education require these for prestige or because the skills and knowledges can only be obtained that way. I think we can show that there are sufficient numbers of industries in the economy which more and more have need of educationally-based skills and knowledge.

The separation of legislation into manpower bills and educational bills, with the same people never being seen as coming under both, puts an undue burden on the employer. He is faced with the problem of training workers who require credentialed training. It has also made it possible for much manpower money to wind up in the pockets of overnight-

created "training" organizations which offer neither credentialing nor articulation with the educational system. The training that lower level workers receive essentially gets them no further than the immediate applicability to the next job (if it is applicable at all, and if there is a job at all).

Part of our function in offering technical support is giving advice on strategy. We suggest to hospitals that they get out of the business of producing educational services. As purchasers they can combine their efforts and obtain credentialed training in the sequences which they require, and with the elimination of redundant requirements. However, we would be greatly aided by a national commitment to such an approach.

The systems approach to developing job ladders, if it entails the development of curriculum ladders to go with them, would change the focus or context in which Federal manpower policy is formed, and rechannel the flow of program money. Legislation can begin to demand that training be a step on the way to further training and that this be articulated just as job ladders are articulated, and that training be tied to such ladders.

In the course of our work, we designed a nursing sequence which presents a classic example of the kinds of problems facing upgrading programs.[2] The nurse aide - practical nurse - staff nurse ladder is obvious and is not based on our job analysis method. We showed, however, eight

[2] Research Report Number 1, Train Practical Nurses to Become Registered Nurses: A Survey of the PN Point of View.

different kinds of tracks which individuals in the hospital system could follow to go from nurse aide to staff nurse. Some include remediation. Staff nurse requires the RN license and the associate degree level or higher, or a three-year diploma. Among these eight tracks are several which could take the nurse aide to the practical nurse level but which, at the point where she is a practical nurse, has her half-way to the associate degree level in nursing.

It is now impossible to implement such a design through one current piece of legislation, through one government department, or without structural changes in educational institutions and state education departments.

Fragmented Support

The employer has to cover two kinds of costs: payroll costs and education costs. He either must maintain the salaries of trainees studying on a release-time basis and pay for relief workers, or face a reduction in output. He might try to apply for stipends for his trainees so he can pay only for time worked. There are then the costs of paying for the training. Even free public schools will have to finance expansion of plant and faculties because there will be enrollment increases.

At the present time there is no single piece of legislation that will pay these costs on an on-going, regular basis, or help in some interim period. At least four different pieces of legislation, administered in different departments at Federal and State levels would have to be involved.

Legislation and the educational system send us to a separate place for remediation, a separate place for skill training for lower level jobs and a separate place for professional training. There are stipends for hard core unemployed, stipends for people in skill training, but there is no help or money for relief workers or tuition money for employed workers who are going to school on a release-time basis. There is no incentive for the educational institution which would have to expand facilities and faculty in order to accommodate the needs of employed workers in their upgrading sequences.

Thus,it would take an enormous amount of imagination and political pressure to develop the kind of organic programs outlined, ones which essentially cost the least amount of time and effort to implement because they minimize the training time and the relief time necessary to bring people from the entry level to the upper levels. At the moment, I find that the institutions simply do not have personnel with the training, orientation or imagination needed to design funding proposals, to carry out the steps, and do the interlocking planning necessary to implement any kind of upgrading sequence which is built on educationally-based ladders.

TECHNICAL SUPPORT

Having said all this, I think I can move on to the relationship between the kind of technical support which we offer and what we have learned to be the most serious problems we face in the implementation of anything that might be proposed out of the methodology which we are developing.

We offer technical support in the sense that, having designed the methodology, we collect our own data and will be designing job ladders for the institutions that we are studying. As a spin-off of this we will be identifying the curriculum needed to carry people from one job to the next-higher related job, in a sequence of jobs within skill families. The technical support lies in the specific recommendations. We will also offer another kind of technical support. We are and will be training organizations to use our methodology. We expect to continue to be funded in a way which will permit us to train people to go back to their own organizations and apply the method.

We also must offer another kind of technical support, based on the existence of the issues which I have outlined. We have discovered, for example, that, having designed a job ladder, having identified the necessary training steps, we must also help an organization understand the need for institutional changes to make implementation possible. In addition, we have found that it is almost beyond the possible for any institution to come up with people who can put together a package for implementing the kinds of proposals we are suggesting, for the reasons we are suggesting. I would like to see Federal manpower policy change enough to make at least the latter kind of technical support unnecessary.

I suggest to you that fragmented legislation, with emphasis on entry level training rather than emphasis on upgrading sequences, without attention to the real costs of employers, dissuades employers from planning to help themselves. And I suggest to you that there is now no impe-

tus for the educational system to really face up to its responsibilities in training the labor force of this society to operate its technology.

We have essentially abandoned our generation to the effects of miseducation and malplanning in the face of very rapid changes in the composition of manpower requirements. If we do not make a strong turnaround on these issues I suspect that we will be facing more and more serious upper and middle level shortages, and we will not be answering the upward mobility needs of the employed poor or the unemployed.

I urge you to help create legislation which requires that the educational system become a partner in manpower planning and development, to free funding allocations so that manpower programs can accommodate industry's organic needs for upgrading its own labor force through formal educational institutions where this is appropriate or where it is required. I cannot urge too strongly this change of emphasis. This would make it possible for the kind of technical support which we offer to have some meaning and to have some hope for implementation.